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FRANKLIN INSTITUTE

OF THE STATE OF PENNSYLVANIA,

FOR THE PROMOTION OF THE MECHANIC ARTS.

DEVOTED TO

MECHANICAL AND PHYSICAL SCIENCE,

Civil Engineering, the Arts and Manufactures,

AND THE RECORDING OF

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JANUARY, 1859.

CIVIL ENGINEERING.

For the Journal of the Franklin Institute.

Practical Observations on the Introduction of Preservative Solutions into Railway Timber. By F. Hewson, C. E.

The use of timber upon our railroads is considered indispensable; it is everywhere found in the superstructure of our tracks, and forms the chief material of our bridges; its renewal is the most expensive item of repairs. The life of a sill seldom extends beyond eight years, and the rate of annual depreciation being $12\frac{1}{2}$ ℔ cent., can be applied to the estimate for the durability of the bridges, and those structures which are unprotected against the assaults of heat and moisture, the active and unfailing agents of decay.

There are cycles in the history of a railway like in that of nations; each has its era of good feeling, and the blessings of cheap government, to be followed by discontent and grievous burthens. The close of the first octennial period in the existence of a railroad track, is marked by the entire renewal of its wooden superstructure, involving an additional expenditure for labor. About a year or two preceding this troublesome epoch, the managers and proprietors become alarmed at the rapid and disproportionate increase in their repair accounts; the spirit of economy and reduction is infused into every department, and laudable efforts are made to restore the cheap management of previous years; those efforts are in vain, for the skill and fidelity of their officers and workmen cannot check the onward progress of perishable material to its destiny.

Upon the 25,000 miles of the railway lines in the United States, it is here estimated that 3125 miles of the timber superstructure of their track are annually renewed, requiring an outlay of 3,500,000 dollars to furnish the supply.

These prefatory data show the importance of seeking some effectual method of arresting this enormous waste of capital. The chief obstacle to this end, has been the great outlay required in the outset for the apparatus employed by the usual process, which is so inconvenient in character as to preclude their adoption in the construction of our railroads. These objections of expense and inconvenience are applicable to the systems of Kyan, Bethell, and Sir William Burnett, systems which have been adopted upon the leading works of Europe, by engineers distinguished alike for their genius and soundness of judgment.

Kyan's process is the simple immersion of the timber in corrosive sublimate dissolved in water: it requires the employment of two tanks or reservoirs, into one of which the solution is pumped while the timber is being withdrawn.

It has been severely tested in the dock-yard of Woolwich, and has been employed with success on the Bavarian state railways. The writer has not been able to find any evidence against its efficacy.

The solution is an expensive one, besides being an active poison, which renders its adoption dangerous.

Bethell's process requires a strong cylindrical tank of iron, a steam engine, an air pump, a force pump, and a large wooden cistern or reservoir—when the timber is placed inside the cylinder which is air-tight, a vacuum is obtained, and the solution, which is either coal oil or pyrolignite of iron, is forced under a heavy pressure into the timber.

It has been successfully employed upon the Great Western, the Bristol and Exeter, Manchester and Birmingham, North Eastern, South Eastern, Stockton and Darlington, London and Birmingham, and Cologne and Minden railways. It has received the endorsement of Robert Stephenson, Brunel, Bidder, Braithwaite, and other eminent names.

Sir William Burnett's process employs the chloride of zinc, with the same apparatus and mode of operation used by Bethell. It has been successfully tested on the Hanoverian and the Cologne and Minden lines, and has been used on the Oxford, Worcester and Wolverhampton, the Oxford and Birmingham, and the Vale of Neath railways.

Brunel has taken an active part in its introduction on the public works of England.

There has been a want of confidence relative to the treatment of timber by other systems. The processes of boiling timber or heating it to a high degree of temperature, and suddenly plunging it into the solutions, have been condemned by the highest authorities.

In the Ordnance Manual for the use of the officers of the United States Army, edited by Major Mordecai, assisted by Colonels Baker, Ripley, Huger, and Major Symington, able officers, honored alike for attainments in science and services rendered under the flag of their country, it is stated that "kiln drying is serviceable only for boards

and pieces of small dimensions, and is apt to cause cracks and to impair the strength of wood, unless performed very slowly, and that charring or painting is highly injurious to any but seasoned timber, as it effectually prevents the drying of the inner part of the wood, in which consequently fermentation and decay soon take place. Also in noticing Earle's process, which consists in saturating the wood in a hot solution of copperas and blue vitriol mixed together, has been tried by the ordnance department, but the results have not been favorable as far as regards its effects upon the strength and preservation of the timber." Boucherie also mentions his want of success in rarefying by a regulated heat, the air included in the interior of the wood, and then plunging it at once into the solutions, which he wished to introduce, though by this method, he caused different liquids to penetrate materials of a very compact nature, and he succeeded in forcing tar into stones and bricks to a very great depth. The same authority states, "That it is infinitely more advantageous to act upon wood in its green state, than to prepare it after the time necessary for its complete dessication had sensibly altered it."

Tredgold, in his able and lucid manner, accounts for the effects upon the durability of timber produced by these processes which have thus been condemned—he says, "that it is well known to chemists that slow drying will render many bodies less easy to dissolve, while rapid drying, on the contrary, renders the same bodies more soluble; besides, all wood in drying loses a portion of its carbon, and the more in proportion as the temperature is higher; there is in wood that has been properly seasoned a toughness and elasticity which is not to be found in rapidly dried wood, and this is an evident proof that firm cohesion does not take place when the moisture is dissipated at a high heat."

The evidence of the Saxon and Bohemian railways given in the 29th number of the *Eisenbahnzeitung*, and translated to the valuable columns of the *United States Mining Journal*, practically confirms the unfavorable views of the authorities here quoted.

Additional adverse testimony could still be brought, but its introduction here would extend this communication to a wearisome prolixity.

The employment of the popular European methods of Bethell and Sir William Burnett upon American railways, which are too often started in haste, and without the means sufficient to properly complete them—would be attended with two objections, in some instances so weighty as to prevent their adoption,—they are,

1st. The expense in the first cost of the apparatus required.

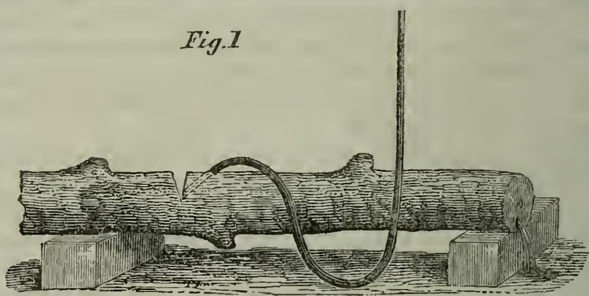
2d. The difficulty in its proper location along the line of a route under construction.

What is wanted is some process which shall be simple, cheap, and efficacious. Boucherie's system of introducing the solutions longitudinally, through the pores or tubes of the timber, by the pressure of a column of any convenient height, is a step in the right direction to meet these necessities. A description of his first methods of operating has already been furnished in previous numbers of the *Journal.*

An account of the more recent improvements which have been adopted is given by Mr. John Reid, Jr., of Glasgow; an extract will not be deemed irrelevant.

"After the tree has been felled, a saw cut is made across the centre through about $\frac{9}{10}$ths of the section of the tree, which is slightly raised at the centre by a lever or wedge so as to open the saw cut a little; a piece of string or chord is placed around the edge of the saw cut, and lowering the tree again, the cut closes on the string, which thus forms a water-tight joint; an auger hole is then bored obliquely into the saw cut from the outside, into which is driven a hollow wooden plug; a flexible tube is fitted on the plug, the end of which is made slightly conical, so that the tube may be pushed tight upon it; the fluid flows from a cistern at an elevation of from 30 to 40 feet." (See Fig. 1.)

Fig. 1



Mr. Reid further adds that the timber is most successfully operated upon within ten days after being felled, in which event, the process with a log 9 feet long will occupy twenty-four hours. If the timber is felled three months, three days are required; if four months, four days.

To expedite the longitudinal transmission of solutions, an ingenious and simple apparatus has been contrived by John L. Pott, Esq., the intelligent proprietor of the Orchard Iron Works, in Pottsville; some idea of which can be formed by the following description.

It consists of a force pump, to the cast iron frame of which is bolted a strong cylinder, also of cast iron, 9 ft. long; the inside diameter being 12 inches. Into the further end of the cylinder, a hollow cast iron collar is accurately fitted, but can be withdrawn and replaced at pleasure, the joint being water-tight—from the sectional end of the collar which is foremost in the cylinder, there extends a rectangular punch sharpened and edged with steel, the area of which being less than the cross section of the railroad sills in use. This is driven by beetles into the end of the sill placed in the cylinder, and then firmly secured by strong bolts connected with the apparatus.

This plan of cylinder head makes a water-tight joint, and at the same time allows the sap to escape, and secures a greater pressure at the end of the sill which lies against the pump. The power is applied by hand with a crank.

The writer experimenting with this apparatus, found that in certain classes of timber which were freshly cut, the sap would be driven out

with great force, rapidly followed by the solutions. This was noticed especially with the rock, red, and black oak sills.

Under a heavy pressure varying from 1000 lbs. to 1500 lbs. per square inch, working for about two minutes, the sap for a few seconds would be ejected from the end of the sill; this would flow sometimes in jets like the discharges from the common garden watering pot, and at other times trickling in frothing exudations.

It was found that in white oak sills under the enormous pressure of 1320 lbs. per square inch, the maximum gain in weight was 11½ lbs. per sill, or 3·8 lbs. per cubic foot.

In black oak under 800 lbs., the maximum gain was 17½ lbs. per sill, or 5·8 lbs. per cubic foot.

In red oak under 1400 lbs., the maximum gain in a sill was 29 lbs., or 9·6 lbs. per cubic foot.

In Chestnut under 1500 lbs. per square inch, the maximum gain in a sill was 13 lbs., or 4·3 lbs. per cubic foot.

Upon cutting the sills most successfully operated upon, into thin cross sections of two inches in thickness, they were found to be so fully saturated, that by striking them violently against a board, the solutions would exude and cover the surface with moisture.

Though it required but two minutes in operating the pump for the complete impregnation of the sills, yet the time occupied in adjusting and removing the sill, and in filling and draining the cylinder, amounted to 18 minutes, and the saturation of 25 sills was the average work accomplished in ten hours.

Boucherie's process is held in high esteem by his countrymen; it has been adopted on the Northern, the Eastern, and Nantes railways of France—and has been further sustained by a Board of Engineers of the Ponts et Chausées, and officers of Genise, in a favorable report to the Government.

It has certainly great merit, yet the importance of operating on the timber within a few days after it has been felled, and the manipulation required in its preparation, will cause inconvenience in the construction and repairs of American railroads.

After a close analysis of the cost and details of the various systems, the writer has been induced to select capillary attraction as the agent for introducing the solutions by the correct way shown to us by nature in the vegetative process, viz: by expelling and following the sap longitudinally, through the pores and tubes of the timber.

Preceded by a number of satisfactory experiments, the following plan has been adopted:

The sills are placed vertically with butt ends down in a tightly caulked rectangular tank, 14 ft. long, 6½ ft. wide, and 8 ft. deep, built of 3-inch plank supported by upright stays, and further secured by transverse bolts, which prevent the sides from spreading. (See Fig. 2.)

When the tank is packed with sills, sufficient solution is added to fill it to the top of the sills.

In this simple apparatus, the pressure of a column seven feet in height is thus maintained at the butt end of sill, the sap is expelled,

1*

and the preserving solution takes its place—a tank holding one hundred sills will cost about $70, and weighing when empty, about 2 tons, it can easily be transported to any part of the road.

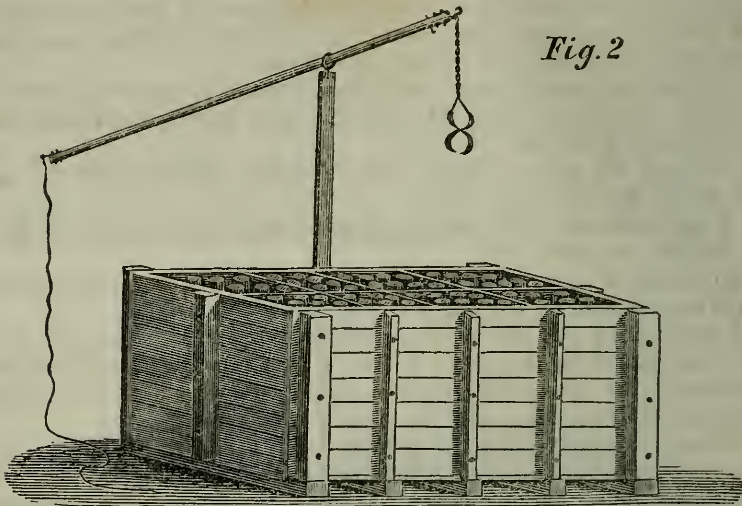


Fig. 2

The number and kind of timber operated upon, together with the weight gained, and the estimated quantity of solution absorbed, are given in the following table: The sills remaining seven days in the tank—the solution consisting of one part of pyrolignite of iron, and six parts water.

Kind of timber.	No. of sills operated upon.	Average pounds gained per sill.	Average pounds gained per cu. ft.	Average gallons per sill.	Average gallons per cubic ft.	Maximum gallons per cubic foot.
White oak,	1038	8·9	3·1	1·8	0·62	1·87
Rock oak,	96	11·5	3·9	2·38	0·78	1·87
Red oak,	153	10·0	3·9	2·04	0·78	1·70
Black oak,	903	9·6	3·6	1·87	0·72	2·64
Chestnut,	143	6·1	3·0	1·20	0·60	1·87
Hemlock,	617	7·5	2·6	1·51	0·52	1·87

After the lapse of seven days the increase of weight in the oaks appeared to be checked. The chestnut and hemlock being slower in absorption would require 14 days to complete their saturation. These facts ascertained by preliminary experiments, account for the discrepancy in the above table in the averages of these classes of timber.

The writer encountered some difficulty in estimating the exact quantity (liquid measure) of the solution absorbed, as the amount of sap displaced in the green timber is considerable, and consequently the estimate of the quantity of the solution absorbed from the weight

gained would be incorrect. After a careful investigation it was found that the increase in the measure of the solution received by the sill, averaged 70 ℔ cent. over and above the quantity called for by the gain in weight of the sill.

This increment is taken into the calculation of the gallon columns of the table.

In order to ascertain the relative extent or degree of absorption of the popular solutions by the different classes of timber, the writer caused to be divided into three equal parts, a rock oak, a white oak, and hemlock sill, each as thus divided was placed vertically in separate casks, which were filled with the solutions.

Cask with the chloride of zinc one pound to 10 gallons of water.
" blue vitriol one pound to 12½ gallons of water.
" the pyrolignite of iron (density 1·101), 1 part pyrolignite to 6 parts water.

After the duration of one week

The *white oak* stick in the chloride of zinc,	gained in weight,	6·8	per cent.
" " blue vitriol,	"	7·9	"
" " pyrolignite of iron,	"	10·7	"
The *rock stick* in the chloride of zinc,	"	4·8	"
" blue vitriol,	"	4·6	"
" pyrolignite of iron,	"	5·6	"
The *hemlock stick* in chloride of zinc,	"	9·7	"
" " blue vitriol,	"	10·1	"
" " pyrolignite of iron,	"	7·6	"

The blue vitriol is absorbed more readily by the hemlock, and the oaks prefer the pyrolignite.

For the impregnation of the heavy timbers used upon bridges and other structures, a large wooden cistern 4½ feet diameter in the clear, and 27 feet deep, was constructed of 3-inch seasoned white pine plank, tightly caulked in the seams, and bound with iron hoops; two courses of 3-inch plank were laid transversely and firmly secured at the bottom of the cistern.

This, when finished by the carpenters, was sunk into the ground until the top edge stood three feet above the surface. A hoisting crane is used in lifting the timber; the sticks being placed in a vertical position in the cistern, which should always be kept filled to its top edge with the solution—in this way, a pressure of a column of 27 feet in height is maintained at the butt end of the timber.

The following table shows the quantity of solution introduced into a cubic foot of the different woods—the solution consisting of one part of pyrolignite of iron and six parts of water:

Kind of timber.	Number of cubic feet.	Average absorption per cubic foot.	Maximum absorption per cubic foot.
White oak,	542	0·53 gallon.	2·72 gallons.
Rock oak,	833	0·71 "	2·04 "
Red oak,	39	0·93 "	1·87 "
Black oak,	67	0·85 "	1·45 "
White pine,	166	1·10 "	2·04 "

Timber freshly cut will receive the solutions more readily than when dry—some pieces of white oak which had been felled three months,

absorbed per cubic foot 76 ℔ cent. more than the same description and sizes of timber which had been twelve months felled.

It was also observed that in pushing some freshly cut beams with a sudden downward force into the cistern, the sap would appear on the top of the beam often in quantities to fill a wine glass.

These facts confirm the opinions of Boucherie, and show that the drying and seasoning of timber to prepare it for impregnation is an unnecessary waste of labor.

The expense of impregnating railway timber with the process advocated by the writer is but trifling.

The labor required is involved only in lifting and carrying the timber, and to this must be added the cost of the solutions absorbed. A statement of the cost of preserving sills with the usual antiseptics is here given.

Chloride of Zinc

In proportions used by Brunel, viz: one pound to 10 gallons of water—cost of chloride of zinc 9 cents per pound.

Labor at tank, lifting and carrying the sills,	1·0 cent.
Solution absorbed, 2 gallons,	1 8
Cost per sill,	2·8 cents.

Blue Vitriol

In the proportions adopted by Boucherie, viz: one pound to 12½ gallons of water, cost of blue vitriol 14 cents per pound.

Labor at tank, &c.,	1·0 cent.
Solution absorbed,	2·24
Cost per sill,	3·24

Pyrolignite of Iron

In the proportions adopted by the writer, viz: 1 part of pyrolignite to 6 parts of water—cost of pyrolignite 23 cents per gallon.

Labor at tank, &c.,	1·0 cent.
Solution absorbed,	6·5
Cost per sill,	7·5

The writer does not claim that this method of impregnating timber by capillary attraction is superior to any process extant, for such an assumption at this period would certainly be premature and somewhat arrogant. The question of its efficacy hangs upon a single point, which is this. Does it introduce a sufficient quantity of the preservative solutions to produce the desired effect? From the mass of data condensed in the tables given above, it appears that the average degree of absorption varies in the different classes of woods. The average of the sills impregnated in the tanks range from 0·52* to 0·78* of a gallon per cubic foot. The averages of the timbers in the cistern from 0·53* to 1·10* of a gallon per cubic foot.

In the interesting account of the Burnettizing establishment, at Gloucester, England, carried on under the direction of J. K. Brunel, Esq., C. E., published by J. B. Francis, Esq., it is stated in the course of describing the operation of the apparatus, that in a partial vacuum, a pressure of 120 ℔s. to the square inch is maintained from two to

* American gallons.

four hours until ·6* of a gallon of the solution is forced into each cubic foot of timber, and this amount is deemed sufficient. With this favorable and reliable evidence, the writer is sustained in the opinion that capillary attraction can be advantageously employed as the agent of introducing preservative solutions into railway timber. Its chief merit rests on the simplicity of its requirements in the outset, and the economy of labor in its use.

Pottsville, Pennsylvania.

* Imperial gallons.

Employment of Artillery in Public Works.

From "Nouvelles Annales de la Construction, August, 1858."

They are now working in the "Départment de l'Ariége, (France,) on the improvement of the Imperial Route, No. 119, which, according to the location adopted, passes through the grotto of Mas-d'Azil, which has already been opened. At the entrance of the grotto, and at the highest part of the arch, there hung an enormous block of stone, presenting a considerable surface and adhering in a very imperfect manner to the adjacent rock.

Suspended at a height of 197 feet (60 metres) above the road, this rock menaced the safety of the travel; it was very necessary to detach the parts threatening to fall, and to consolidate the rest.

The engineer in charge of the works, saw that in blasting under such circumstances, the difficulties were almost insurmountable, and it seemed that cannon only could dislodge this inaccessible obstacle.

He therefore wrote to the prefect of Ariége to ask him for the assistance of some artillery, when, fortunately, a battery of the 10th regiment of that arm passed through Labastide about ten kilometres from the grotto.

The officer of this battery, having received in the mean time by telegraph, orders to consult with the engineer, and to assist him, if possible, went on the 19th of June to Mas-d'Azil with two pieces (canons obusiers,) of four inches (0·12 m.) diameter.

He placed these pieces on the road at a distance of 820 ft. (250 m.) from the grotto, in such a position, that notwithstanding the height of the rock, the limit of the angle which the gun could make with the horizon was not passed. The two guns threw with a remarkable precision. At the fourth shot the operation was finished, all portions of the rock which had seemed not to be intimately connected with the arch having been removed. The large block remained, but was no longer menacing; to prove its solidity, several balls were lodged in an open crack on the slope of the hill, and during this firing no movement was manifested in the mass, although the projectiles were forced to break off the edges of the rock and to penetrate like wedges.

F. R.

*Experiments on the Absolute Strength of Iron and Steel.** By M. Meissner, Civ. Eng., Vienna.—From Jour. of Soc. of Engineers, Austria, 1858.

KIND.	Mark.	Dimensions in Vienna sq. inches. Breadth.	Depth.	Cross section, Vienna sq. inches.	Break'g weight Vienna pounds.	Breaking weight per sq. in.	Mean breaking weight per square inch.	Cross section of fracture square ins.	Cohesion shown by sect'n of fract.	Mean cohesion per square inch.	REMARKS.
1. Shear steel, hard,	I A	0·334	0·327	0·109	9795	89·860	86·852	A I 0·078	125·570	126·100	1. But little change of form just before breaking; without perceptible stretching; broken short; fracture fine-grained.
	B	0·327	0·329	0·107	9910	92·620		B 0·870	127·050		
	C	0·330	0·334	0·112	9650	86·160		C 0·075	128·660		
	D	0·332	0·332	0·111	9250	83·330		D 0·074	125·000		
	E	0·332	0·326	0·109	8970	82·290		E 0·073	123·000		
2. Shear steel, soft,	II A	0·334	0·330	0·110	8350	75·910	77·600	A II 0·065	128·460	130·000	2. (Broken quickly. The bars stretched perceptibly before breaking; fracture fine-grained.
	B	0·280	0·275	0·077	—	—		B 0·050	—		
	C	0·333	0·330	0·110	9100	82·730		C 0·075	121·340		
	D	0·336	0·329	0·111	8590	77·390		D 0·073	117·670		
	E	0·328	0·332	0·109	8100	74·310		E 0·053	153·000		
3. Cast iron, (bloomed with charcoal,)	III A	0·322	0·320	0·103	4300	41·750	41·180	A III 0·048	90·000	99·250	3. Stretched very perceptibly and very long before breaking. Fracture, fibrous, ragged.
	B	0·338	0·338	0·113	4680	41·420		B 0·049	95·520		
	C	0·338	0·338	0·113	4620	40·880		C 0·048	96·240		
	D	0·348	0·349	0·121	4870	40·250		D 0·050	97·400		
	E	0·332	0·320	0·107	4450	41·590		E 0·038	117·100		
4. Cast iron, (puddled with bituminous coal,)	IV A	0·261	0·262	0·068	2690	39·560	39·390	A IV 0·032	84·060	83·500	4. Like No. 3.
	B	0·258	0·252	0·065	2570	39·540		B 0·033	78·000		
	C	0·347	0·340	0·118	4590	38·900		C 0·055	83·460		
	D	0·262	0·259	0·068	2650	36·570		D 0·029	84·500		
	E	0·260	0·256	0·066	2800	42·420		E 0·032	87·500		
5. Cast steel, hard, (not easily welded,)	2 A	0·262	0·265	0·069	7500	108·700	110·190 without B.	2 A 0·048	156·250	148·120	5. Little change of form; no perceptible stretching; short fracture, very fine-grained.
	B	0·255	0·255	0·065	8950	137·690		B 0·062	144·340		
	C	0·261	0·260	0·067	7650	114·180		C 0·049	156·130		
	D	0·260	0·260	0·068	7790	114·560		D 0·055	141·640		
	E	0·271	0·263	0·071	7540	106·200		E 0·053	142·260		
6. Cast steel, soft, (capable of welding,)	4 A	0·336	0·338	0·113	11350	100·440	112·508	4 A 0·064	177·340	167·940	6. Stretched perceptibly before breaking. Fracture, fine-grained in middle; ragged at edges.
	B	0·342	0·338	0·115	14660	127·480		B 0·086	170·470		
	C	0·346	0·346	0·120	13520	112·670		C 0·975	180·300		
	D	0·346	0·346	0·120	13530	112·750		D 0·090	150·000		
	E	0·332	0·334	0·111	12120	109·200		E 0·075	161·610		
7. Cast steel, very soft, (easily welded,)	6 A	0·335	0·335	0·112	10020	89·460	88·970	6 A 0·062	156·550	160·400	7. Stretched until breaking. Fracture, fine-grained in middle; finely ragged at edges.
	B	0·352	0·350	0·124	11250	90·730		B 0·074	152·030		
	C	0·327	0·326	0·106	8950	84·430		C 0·047	190·410		
	D	0·334	0·332	0·111	0740	87·750		D 0·070	130·150		
	E	0·339	0·340	0·115	10650	92·610		E 0·065	163·850		

*Experiments on various modes of Raising Water.** By MM. Morandiere & Compaing.—*Annales des Ponts et Chaussées*, 1857.

Machine.	Day's work in hours.	Cubic metres of water raised by a man one metre high.		Daily wages of workmen.	Cost of 1 cubic metre of water raised 1 metre high.	Cubic metres of water which can be raised per hour.	Cost of hour's work.	Limits within which the method can be used.
		per hour.	per day.	Francs	Francs		Francs	Metres.
I. Archimedes Screw.								
1. Worked by men,	6	12·75	76·50	2·70	0·035	102·00	3·60	2—4
2. " horses,	—	—	—	—	0·009	85·50	0·75	"
3. " steam,	—	—	—	—	0·0043	165·00	0·70	"
II. Pumps.								
4. Worked by men,	6	9·00	54·00	2·70	0·050	54·00	2·70	1—8
5. " horses,	—	—	—	—	0·011	66·00	0·75	"
6. " steam,	—	—	—	—	0·006	79·00	0·47	"
7. Common water shovel	8	6·00	48·00	2·00	0·042	—	0·25	0—1·2
8. Holland "	8	15·00	120·00	2·00	0·017	—	0·25	"
9. Bucket,	8	4·00	32 00	2 00	0·063	—	0·25	0—1·8
10. Bucket with windlass,	6	15·00	90·00	2·00	0·030	—	0·45	4—20

* Zeitschrift, 1, 1858.

For the Journal of the Franklin Institute.

On the Calculation of the Earthwork of Roads on Sidelong and Irregular Ground. By Prof. Wm. M. Gillespie, of Union College, New York.†

A former article (published in this *Journal*, Dec. 1857, page 372,) investigated the nature of the warped surfaces of ground which usually form the upper or lower faces of the solids removed or added in road excavations and embankments, and showed that the contents of such solids could be calculated with perfect precision by the familiar prismoidal rule. It is now proposed to compare the results given by this rule with those obtained by the usual methods, and to establish formulas by which the nature and the amount of the errors which these latter involve can be determined in advance.

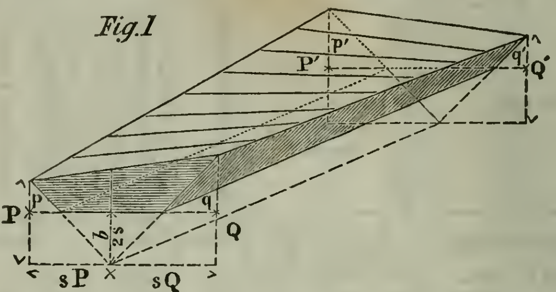
A type of the solids in question is represented in fig. 1, as an excavation seen in perspective. Inverted, it will represent an embankment.

To simplify the investigation, we will conceive the side-slopes to be prolonged till they meet, as shown by the broken lines in the figure. The conclusions at which we may arrive respecting the new solid thus

† An abstract of a portion of this paper was read at the late Baltimore meeting of the "American Association for the advancement of Science."

produced, will apply equally well to the original one, since the triangular prism which we imagine added, is common to both the solids discussed, whatever hypothesis we may adopt respecting their upper

Fig. 1



surfaces. The additional depth is equal to the bottom width divided by twice the ratio of the base of the side-slopes to their height, or to $b \div 2s$, in the usual symbols. We will suppose the original outside depths p, q, p', q', of the end sections, to be increased by this quantity, and will call these new depths, P and Q for one section, and P′ and Q′ for the other.

Then the area of the triangle which forms one end of the new solid, is the difference between the trapezoid whose parallel sides are P and Q, and the two triangles which have P and Q for their altitudes and sP and sQ for their bases, and is

$$\tfrac{1}{2}(P+Q)\times(sP+sQ)-\tfrac{1}{2}P\times sP-\tfrac{1}{2}Q\times sQ=sPQ.$$

Similarly, the other end area is $sP'Q'$. The middle section will have the outside depths, $\frac{1}{2}(P+P')$ and $\frac{1}{2}(Q+Q')$. Consequently its area is

$$s\times\tfrac{1}{2}(P+P')\times\tfrac{1}{2}(Q+Q')=\tfrac{1}{4}s(P+P')\times(Q+Q').$$

The true content of the solid under consideration will then be

$$\tfrac{1}{6}l\Big[sPQ+sP'Q'+4\times\tfrac{1}{4}s(P+P')\times(Q+Q')\Big]$$
$$=\tfrac{1}{6}sl(2PQ+2P'Q'+PQ'+P'Q), \quad . \quad . \quad (1)$$

We are now prepared to compare with this correct result those given by each of the usual methods of calculation.

I. The method of "*Averaging end areas*" will first be examined. This considers the content of the solid to equal the product of the half sum of its end areas by its length; *i. e.*, using the same symbols as above,

$$\tfrac{1}{2}l(sPQ+sP'Q'), \quad . \quad . \quad . \quad (2)$$

The excess, if any, of the true content above this, will therefore be obtained by subtracting (2) from (1). It is found, after a little reduction, to be

$$\tfrac{1}{6}sl(PQ'+P'Q-PQ-P'Q') \quad . \quad (3)$$

The value of this expression is not changed by substituting in it the original depths for the increased depths, (owing to its symmetrical character,) and it then becomes,

$$\tfrac{1}{6}\, s\, l\, (p\, q' + p'\, q - p\, q - p'\, q'), \qquad . \qquad . \quad (3')$$

We infer from this formula, that *the true content exceeds the content given by "Averaging end areas"* whenever $p\, q' + p' q > p\, q + p' q'$; *i. e., whenever the sum of the products of the pairs of depths (or heights) diagonally opposite to each other, is greater than the sum of the products of those belonging to the same cross-section.* When the former sum is the smaller, then the true result is the smaller. The two sums are the same, and the results therefore equal, only when $p = q'$ or $q = q'$; *i. e.*, when the depths on one or the other side of the solid are the same.

It is so well known, however, that the method of "averaging end areas" *always* gives more than the true content of a prismoid, (such as a tapering stick of timber, a mill-hopper, &c.,) that there seems at first glance an apparent inconsistency in the above statement. The difficulty is removed, however, by the consideration that our warped-surface-solid is not a prismoid, although it is to be calculated by the prismoidal rule. A somewhat analogous case is that of a sphere, to which the prismoidal rule also applies, as shown in the ingenious paper of Mr. Ellwood Morris, in this *Journal*, 2d Series, vol. xxv., p. 381.

II. The method of "Middle areas" will next be taken up. This assumes the content to be equal to the product of the area of the middle cross-section of the solid by its length. This content will therefore be expressed in our symbols thus:

$$\tfrac{1}{4}\, s\, l\, (\text{P} + \text{P}') \times (\text{Q} + \text{Q}'), \qquad . \qquad . \quad (4)$$

Subtracting this from the true content (1), we obtain, after a little reduction, for the excess of the former,

$$\tfrac{1}{12}\, s\, l\, (\text{P}\,\text{Q} + \text{P}'\text{Q}' - \text{P}\,\text{Q}' - \text{P}'\text{Q}), \qquad . \qquad . \quad (5)$$

For the reasons before given this may be written thus:

$$\tfrac{1}{12}\, s\, l\, (p\, q + p' q' - p\, q' - p' q), \qquad . \qquad . \quad (5')$$

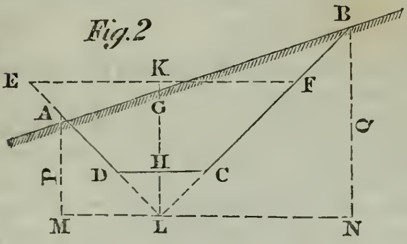
Comparing this expression with (3′), we see that we have merely to *reverse* the deductions there established; and that this method will give results too small when the preceding method gave them too great, and *vice versa.*

The absolute error, however, will be only half so great; the co-efficient in (5′) being only one-half so great as that in (3′).

III. The method of "Equivalent mean heights" (or depths) is now to be examined. It consists (as is well known to engineers,) in conceiving the given solid to be transformed in such a way that its top surface shall be a plane, every where level crossways at right angles to the length, and that the areas of the ends (which have then become level trapezoids,) shall, at the same time, be equivalent to the original areas. The method then assumes that the content of this new solid (which is a true prismoid,) is equal to the original content of the real sidelong, warped-surface-solid.

This is the method which it has long been customary to employ when perfect accuracy was desired; and most of the tables and diagrams for sidelong and irregular ground are constructed on this hypothesis. The question of its correctness is therefore an important one.

Fig. 2



In Fig. 2, let A B C D be one of the original end areas or cross-sections, and let E F C D be an area equivalent to it, but level on top, if in excavation, as here, or level at bottom, if in embankment. K H, the depth of this new cross-section, is called the "Equivalent mean depth (or height)" of the orignal cross-section. We have first to obtain an expression for it, in terms of the original side depths.

The investigation will be much simplified by the same conception as before, viz: by producing the side slopes till they meet, and calling, as before, the new outside depths P and Q. The height, K L, of the triangle E F L, is what is now wanted. The area of A B L was found on page 12 to be s P Q. Then the area $EFL = \frac{1}{2} \times KL \times EF = s\,KL^2$, being equated with S P Q, we obtain $KL = \sqrt{PQ}$.

The equivalent mean heights for the two end areas will then be $\sqrt{PQ}$ and $\sqrt{P'Q'}$; and the middle equivalent mean height will be their arithmetical mean. The corresponding middle area will be

$$\tfrac{1}{4} s\left(\sqrt{PQ}+\sqrt{P'Q'}\right)^2.$$

Using this middle area and the given end areas in the prismoidal rule, we obtain, as the content of the solid by this method,

$$\tfrac{1}{6} l\left[s\,PQ + s\,P'Q' + s\left(\sqrt{PQ}+\sqrt{P'Q'}\right)^2\right]$$

$$= \tfrac{1}{6}\, s\, l\left(2\,PQ + 2\,P'Q' + 2\sqrt{PQP'Q'}\right) \quad . \quad . \quad (6)$$

Subtracting this from the true content (1), we find the excess of the latter is, when reduced,

$$\tfrac{1}{6}\, s\, l\left(\sqrt{PQ'}-\sqrt{P'Q}\right)^2 \quad . \quad . \quad . \quad . \quad (7)$$

This expression is always positive, whatever the value of P, Q, P′, and Q′, with a single exception, when $PQ' = P'Q$. Hence we have arrived at this result: *The method of "equivalent mean heights" gives contents always less than the true content;* with one exception, viz: when the products of the pairs of heights diagonally opposite to each other are equal.

IV. Some engineers have conceived the surface of the ground lying between two such cross-sections as we have been discussing, to be formed by two triangular planes meeting in a line running diagonally from p to q', or from p' to q, (see fig. 1), and thus forming a ridge or a hollow situated in this line.* But such cases would be abnormal ones, and such ground would not "vary uniformly" between the cross-sec-

* See Mr. J. B. Henck's very valuable "Field Book for Railroad Engineers," page 100.

tions. We will, however, examine this conception, as it will lead us to some interesting results.

We will begin by supposing the solid to be bounded on its sides by vertical planes passing through the outer side-lines of its surface, and to have its base pass through the line in which the prolonged side-slopes would meet, so that the heights of its corners will be P, Q, P', Q', as in the preceding discussion.

Let now the diagonal be considered to run from the left hand corner of the nearest end of the solid to the right hand corner of the farther end; say, from the height P to the height Q'. We now have to get the middle area. The middle height of the diagonal $= \frac{1}{2}(P + Q')$. The middle width of the left hand side of the solid $= \frac{1}{2}(s\,P' + s\,Q')$, and the middle left hand height $= \frac{1}{2}(P + P')$. The middle left hand area is therefore

$$\tfrac{1}{2} \times \tfrac{1}{2}(s\,P' + s\,Q') \times \tfrac{1}{2}(P + Q' + P + P').$$

Similarly we get the middle right hand area

$$= \tfrac{1}{2} \times \tfrac{1}{2}(s\,P + s\,Q) \times \tfrac{1}{2}(P + Q' + Q + Q').$$

The sum of these two areas gives the complete middle area. From it deduct the areas of the triangles on each side of the original solid. The left hand one has its height $= \frac{1}{2}(P + P')$, and its base s times that, and the right hand one has its height $= \frac{1}{2}(Q + Q')$, and its base s times that. Using the middle area thus obtained, with the end areas, in the prismoidal rule, we obtain the content of the solid on the new hypothesis. Its expression may be reduced to the following:

$$\tfrac{1}{3}\,s\,l\,(P\,Q + P'Q' + P\,Q'), \quad . \quad . \quad . \quad (8)$$

Subtracting this from the true content (1), we get for the excess of the latter,

$$\tfrac{1}{6}\,s\,l\,(P'Q - P\,Q'), \quad . \quad . \quad . \quad . \quad (9)$$

If we next suppose the diagonal to run in the other direction, *i. e.*, from Q to P', we shall find the excess of the true content then to be

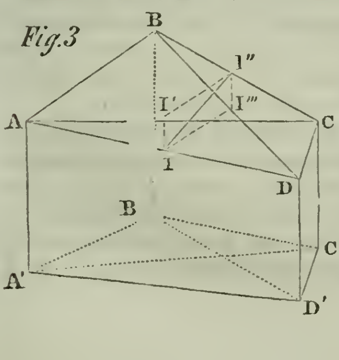
$$\tfrac{1}{6}\,s\,l\,(P\,Q' - P'Q), \quad . \quad . \quad . \quad . \quad (10)$$

Hence we infer that *the error on either hypothesis is numerically the same; though on one in excess and on the other in defect; but that the true content is the greater when the product of the heights which the diagonal joins is less than the product of the other two heights; and vice versa.**

* This admits of the following geometrical proof.

Let $ABCD$ be the surface in question. Consider it to be formed by the two triangular planes ABC, ADC, meeting in AC. Conceive also a vertical plane to pass through AC, $A'C'$, thus forming two truncated prisms. Next consider the surface to be formed by planes meeting in BD, and conceive another vertical plane to pass through BD, $B'D'$. Two other truncated prisms are thus formed. Now conceive a plane parallel to AB and DC. It will cut the four planes of the hypothesis in lines parallel to AB and DC, and will thus form a parallelogram $I\,I'\,I''\,I'''$. The diagonal $I\,I''$ divides the lines AD, BC proportionally, (as follows from the similarity of the triangles formed,) and is therefore a generatrix of the warped surface which lies between the two pairs of planes. But this diagonal of course bisects its parallelogram; the same is true of any other generatrix; consequently the surface which they form is every where midway between the surfaces of the two pairs of truncated prisms, and is therefore equal to half their sum.

Fig.3



It is in this way that the French engineers prove the theorems given in the note on page 375 of vol. xxxiv, Dec. 1857, of this Journal.

Some examples will show the practical bearings of the principles which have now been established.

Example 1. We will begin with the solid represented in fig. 1. It is an excavation a hundred feet in length, all the dimensions being given in feet. Its nearer end has the outside cuttings, $p=6$, and $q=15$; and its farther end has the outside cuttings, $p'=18$; and $q'=12$. The bottom width is 18. The side slopes are 1 to 1. The areas of the ends are 279 and 486. The middle area, obtained from the mean of the outside depths, is 391·5. Then *the true content* of the solid by the prismoidal rule, is 38,850 cubic feet.

Applying to this example the method of "Averaging end areas," we get a content of 38,250 cubic feet, or 600 cubic feet too little. It is too little, because the sum of the products of the depths diagonally opposite to each other is greater than the sum of the products of the depths belonging to the same cross-section. The precise deficiency is given directly by formula (3′).

The method of "Middle areas," gives 39,150 cubic feet, or 300 cubic feet too much; in accordance with formula (5′).

The method of "Equivalent mean heights" comes next. The formula on page 14, gives the "equivalent mean heights" of the two sections as 9·97366 and 14·81176 feet. Their mean gives a "middle area" = 376·65. The corresponding content = 38,860 cubic feet. The deficiency is 990 cubic feet. The same is given in advance by formula (7); since we have (adding $6 \div 2s = 18 \div 2 = 9$ to the original depths,) $P=15$, $Q=24$, $P'=27$, and $Q'=21$; whence,

$$\tfrac{1}{6} \times 1 \times 100\left(\sqrt{15 \times 21} - \sqrt{27 \times 24}\right)^2 = 990.$$

The method of imaginary "Diagonals" gives 33,300 cubic feet, if we suppose the diagonal to run from p to q'; *i. e.*, from 6 to 12, thus forming a hollow; or 44,400 cubic feet, if it runs from p' to q; *i. e.*, from 15 to 18, thus forming a ridge. The deficiency in the former case is 5550 cubic feet; and the excess in the latter case is the same; conformably to formulas (9) and (10).

Example 2. Conceive the outside depths of the farther end of this solid to be interchanged, so that 12 may be on the left and 18 on the right. The true content will then be 37,950 cubic feet.

But "Averaging end areas" still gives the same as before, viz; 38,250 cubic feet. It was less than the true content in the former case, but it is now more, in accordance with formula (3′). The "Middle area" method gives 37,800, or too little, while before it gave too much; this result being still in accordance with formula (5′). "Equivalent mean heights" give the same as before, and therefore still too little.

Example 3. Conceive the depth q', of the solid of Example 1, to be changed from 12 to 15, all the other dimensions remaining the same. The new end area is 567, and the true content becomes 42,300 cubic feet. But $q=q'$. Therefore, according to the principles established on page 13, the method of "Averaging areas" should give the same result, and it does so. So too with the method of "Middle areas." The

method of "Equivalent mean heights," however, still gives too little, because $P \times Q'$ is not equal to $P' \times Q$. On making the calculation (the equivalent heights being 9·97366 and 13·21475,) we get a content= 41,600 cubic feet, or 700 cubic feet too little; and formula (7) gives the same result.

Example 4. In another warped surface solid, let one end area have depths of 15 on the left and 5 on the right, and the other end be 5 on the left and 15 on the right. Let the breadth of road bed be 20 feet and the side slopes 2 to 1. The true content will be 38,333 cubic feet. The "Averaging method" gives 35,000 cubic feet; too little by formula (3'), because

$$5 \times 5 + 15 \times 15 > 15 \times 5 + 15 \times 5.$$

The "Middle area" method gives 40,000 cubic feet, an error in excess of half the amount of the preceding deficiency. "Equivalent mean heights" give 35,000 cubic feet; not enough, because $P \times Q'$, or, 20×20 (adding $20 \div 2 \times 2$ to the given depths) is not equal to $P' \times Q$, or 20×20.

Example 5. Reverse one of these sections so that both may be 15 on the left and both be 5 on the right. The surface is then a plane, and the solid is a prism with a uniform section of 3500 square feet. For this solid all the methods give the same content; and this is a final corroboration of our formulas. The "Averaging" method is now correct, because $p = p'$, each being 15, or because $q = q'$, each being 5. The "Middle area" method is correct for the same reason. The method of "Equivalent mean heights" is now correct, because now $P\,Q = P'Q$.

The method of "Equivalent mean heights" which the preceding investigation most particularly affects, seems to have been introduced by Telford, and has since been adopted without question by most writers (the present one included,) *when perfect accuracy was desired.* The difficulty has been the want of any better standard than itself with which to compare its results. But if the positions which the former paper of the writer endeavored to establish be accepted as correct, this method should be at once and entirely abandoned—since its errors are not of the kind which balance each other in the long run, but are always on the same side—since they are committed too with a belief of its perfect accuracy, and therefore in the most important and delicate cases—and since they may sometimes be of serious moment, the deficiency of the first example given being more than $2\frac{1}{2}$ ℔ cent. of the whole amount; no trifling item in a class of work which on some railroads is counted by millions of yards.

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*Canals and Canal Conveyance.** By W. O'Brien, C. E.

[Extracts from the Prize Essay on Canals and Canal Conveyance for which a premium of £100 was awarded by the Canal Association.]

The dimensions of canals vary according to local considerations, and also according to the notions of engineers. In England there are two

* From the Lond. Civ. Eng. and Arch. Journal, Oct., 1858.

systems of canals: the narrow, with locks 7 feet wide, accessible to boats of 30 to 35 tons; and the broad, with locks 14 to 18 feet wide, and accessible to boats of 60 to 120 tons, the latter however being built without any regard to speed. In the broad canals the width at the surface of the water is about 40 feet. The canals in the north-west of France are accessible to boats of as much as 500 tons, if built in a certain manner, but few convey more than 200 tons freight. The locks most prevalent are 100 feet long by 18 feet wide, the depth of water being from 5 to 7 feet. A great many North American canals admit large vessels under sail. In the North Holland Canal two frigates can pass each other with ease.

A great number of rules have been given for calculating the resistance opposed to the movement of boats on canals; none of them can be relied on; in some cases they only give the relative and not the absolute resistance; in others they give the absolute resistance, but only for old-fashioned boats, which are not likely to be used much longer for traffic on canals. Some notion of the absolute resistance may be obtained from "Wood's Practical Treatise on Railroads."

The following formula is from Claudel's work:

$$E = k\frac{A\,V^2}{2\,g}$$

E, effort in kilogrammes; k, coefficient constant with the same boat; A, area of greatest immersed transverse section in square metres; V, speed in metres per second; g, 9·81 metres = 32·17 feet.

If we reduce this to English measures, that is, pressure in pounds and length in feet, we have

$$E = 0{\cdot}80\ K\ AV^2 \qquad . \qquad . \qquad (1)$$

K having the same signification as before.

K = 1·10 when the boat is a straight prism of which the length is 5 or 6 times its width.

If we suppose the front or bow of the boat to be formed by two vertical planes forming a certain angle with the longitudinal axis of the boat, the values of K according to this angle are

Angle of 78°____30°____6°____bow semicircular.

K=1·05____0.48____0·44____0·57, and with a stern formed by two planes forming an angle of 45° with the boat's keel, these values are

K = 0·94____0·37____0·33____0·46.

K is stated with some fast American steamers to descend as low as 0·045.

The formula (1) shows that, all other circumstances being the same, the effort of traction increases as the square of the velocities; this appears to be true only up to a certain velocity, beyond which it appears that the boat is raised and displaces less water, so that the value of E increases less rapidly than the square of the velocities. The value of K is greater on a canal than in an unlimited expanse of water: cer-

tain experiments tend to show that there is a limit beyond which the diminution of the canal's sectional area does not raise the value of K, but is rather advantageous.

The duty performed by an engine in propelling a boat to a certain distance:—D is expressed by the equation

$$DE = 0{\cdot}80 \text{ K } AV^2 D.$$

But if the work is done by a horse harnessed to a rope which forms an angle a with the direction of the boat's movement, the equation becomes

$$E.D \cos. a = 0{\cdot}80 \text{ K } AV^2 D,$$

part of the horse's power being lost from obliquity of the rope.

Urging horses to a trot in towing boats appears to fatigue them very much, and was only practised for a short time with passenger boats. In France two horses haul a boat with about 100 tons at the rate of about 2 miles an hour. In England one horse hauls a boat with 20 to 30 tons at the rate of $2\frac{1}{2}$ miles. In Holland they go quicker.

For determining the power of the engines of a steamer, the dimensions of which are known, the formula given by Claudel in French measures is

$$\frac{F.Y}{75} = \frac{V^3}{2g} K{\cdot}A \left(1 + \frac{K.A}{K;A}\right)$$

which gives in English measures,—horse power, or

$$\text{H. P.} = 60.\, V^3.K.\, A \left(1 + \frac{K.A}{K;A}\right) \qquad . \quad (2)$$

A is the area of one paddle-board or of two if two paddles are used, in square feet; V, the boat's speed in feet per minute; K, coefficient, varying from 1 to 1·2. This formula supposes the speed to be uniform.

The coefficients, K and K, can be determined approximately by comparison with boats already experimented on. K, may be assumed at 1·1.

If we determine, besides the speed to be attained, the dimensions of the boat and the probable depth of immersion, formula (2) will enable us to determine the horse power of the engines.

$$\frac{a\,\pi\,s}{33000} = \text{H. P.} \qquad . \qquad . \qquad . \quad (3)$$

a, area of cylinder in square inches; π, effective pressure of steam on piston in pounds per square inch; s, speed of piston in feet per minute.

The effective pressure is here assumed to be that indicated by the pressure gauge; whereas it is always a little inferior in the cylinders, and varies if expansion is used,—as of course it should be.

If a screw is applied instead of paddles, formula (2) is still applicable, if A be equal to the area of the vertical projection of the screw, and V equal to the velocity of the screw in the direction of the boat's movement.

The shape and dimensions of boats used on canals can only vary within narrow limits. It was formerly admitted that the lines of ves-

sels should be convex in front: experience has proved that hollow lines are best, both for sea and river boats.

In Europe both river and sea going vessels are usually built with the stem raking forward: this creates a wave in front of the stem. The Americans have introduced the fashion of stems running straight up from the surface of the water.

The form of the stern lines has a great deal to do not only with the steering of vessels, but also with their speed.

Except in sea boats the form of a boat's lines above the water is of little consequence. Deep keel and great draft of water are necessary for the stability of sea-going boats. River and canal boats require a flat floor and no keel.

It cannot be expected that canal boats should be as fast sailers as river boats, but we should try and copy them as far as is compatible with the requirements of a canal navigation. Fine lines not only give speed,—they cause a saving in the cost of propulsion.

History of Canals.

Canals must have been used at a very early age, if not for navigation, at least for irrigation of land: they appear to have been made in Egypt at a very early period. Some time after, they were applied to the cultivation and irrigation of land in Lombardy. The first important step taken with a view to apply canals on a large scale to navigation, namely, the invention of locks, is attributed to Leonardo da Vinci, towards the year 1500. Notwithstanding the importance of this invention, inland conveyance by means of canals does not appear to have been much used till the year 1612, when a Frenchman (Pierre Paul Riquet,) presented Louis XIV. with a project for a canal from the Mediterranean to the Bay of Biscay, which was commenced under M. Riquet's auspices and at his expense. The execution of this canal has only been finished within a few years, and even now works are still going on for enlarging it and improving the supply of water. The works are let to a company, entitled Compagnie du Canal du Midi, by which name the canal is now known. This appears to have been the first attempt to make canals a general mode of internal communication. The Belgian and Dutch canals were begun before, but not under the same difficulties.

The Canal de Briare appears soon after the Canal du Languedoc; it was opened in 1642. England was far behind the continent in canal engineering; but when once the Duke of Bridgewater had set the example, the English capitalists set on in right earnest. It is a curious fact, that while on the continent the development of those two great instruments of progress, railroads and canals, was gradual, and can be traced rather to the increasing wants of the country, than to the leading influence of any individual; in England, on the contrary, their development was so rapid as to assume the form of a mania, and that almost entirely owing to a few men, more particularly Brindley for canals, and George Stephenson for railroads.

The French, however, boast of their Brisson, engineer-in-chief of the Ponts et Chaussées, who devoted several years to perfecting some of the most important canal lines in France, more particularly the northern navigation by St. Quentin and the Oise, the canal parallel to the Somme, and those from the Rhône and Marne rivers to the Rhine.

A canal cannot be too wide if it can be supplied with water. A blunder evident to all engineers was committed both in England and in France, in giving the locks, bridges, viaducts, &c., only just width enough for the passage of one boat, so that any considerable increase in the activity of the traffic or the size of the boats will compel the canal owners to pull them down and rebuild them entirely.

The idea of applying steam power on canals is as old as the application of the steamboat itself: it was tried on the Forth and Clyde canal in 1802, but was abandoned on account of the surge caused by the paddles washing the banks of the canal. In 1812, fresh trials were made, and the banks of the canal protected by a coarse stone pitching. The screw was tried with very good results on the grand canal in 1851. Paddle-boats have not been long in use on French and Belgian canals; the screw has only been in use since 1800, or thereabout, on French canals. Passenger boats tracked by post horses were tried in England and Scotland at the beignning of the 19th century, but were abandoned soon afterwards.

It must not be forgotten that canals were chiefly executed before railways were even thought of; they were made simply with the view of obtaining a better means of communication than that afforded by common roads. This explains the enormous value which canal property had in England for some years.

In Belgium, canals and railroads both belong to government; there has been scarcely any struggle between the railway and canal interests. In France the government owning most of the canals, and having advanced large sums of money for the construction of railways, was obliged to divide its solicitude between the canals and railways. In England the two systems led to a long struggle: the canal owners tried altogether to prevent the public from having railways, at least for the conveyance of heavy goods. After several violent parliamentary contests, the railway owners, not content with gaining their cause by obtaining an act of concession, turned all their efforts to ruin the canal owners by conveying traffic at the lowest rates, frequently at their own loss. Instead of trying to ruin the railway interest in England, the canal owners ought rather to have sought means of satisfying the public wants, in such a manner as to induce carriers to adopt the canal rather than the railway. But they had enjoyed for years such a complete monopoly, that improvement was thought of too late, and the canals were bought or silenced in many instances by the railway companies.

Present Position of Canals.

There are five different modes of conveying goods: 1. Coasting or maritime navigation; 2. Navigation on rivers; 3. Navigation on canals; 4. Common roads; 5. Railroads.

Wherever the first mode of conveyance can be adopted without materially increasing the distance, and if very great velocity is not required, it is and alway will be preferred. Allowing for sea risks, it is still the cheapest of all the five, and offers great facilities for loading and unloading, and for stowing goods in the best manner for their preservation. The application of the auxiliary screw system will not probably, on an average, raise the price of freight considerably, as the increase of working expenses which it causes is compensated by a great saving in time.

Common roads will ere long cease to be applicable except for short distances, or in very rugged and mountainous countries. They certainly offer one advantage: it is, that they can be made everywhere, and in some places offer the only mode of conveyance possible.

Railroads are less expensive, but except at high velocities are more so, than every kind of navigation. The characteristic advantage of railways is the enormous velocities which they allow one to attain.

The resistance on roads and railways is independent of the rate of velocity. On the latter it is about ·86 of that on roads. The resistance to a boat's movement varies as the square of the velocities, and at a speed little exceeding 4 miles an hour is superior to that on railroads. No limit scarcely can be assigned to the velocity attained on a railway. What advantages does navigation offer to compensate for the loss of such an important one as this? It offers first, that of economy; and secondly, that of being able to convey almost unlimited quantities in a given time; for we find in formula (1) that the resistance in this case varies but little with the length of the vessel, an increased length having only for effect a slight alteration in the value of K, so that thousands of tons can be conveyed by a single boat at sea or by a single train of boats on a river or canal, at a moderate expenditure.

Canals chiefly differ from rivers as regards the cost of conveyance, in requiring a greater outlay of capital, and being generally narrow, the motive power is not applied in the most advantageous manner; they are consequently less advantageous as a means of conveyance than rivers, unless the latter have a rapid current, or are much longer on account of windings.

The competition between railways and canals is a very serious question; the railway companies trying to absorb all the traffic of heavy goods, and run down the canal owners. It has been seriously considered by the French and Belgian governments, and has ended in their maintaining and even extending their canals, and reducing the tolls.

Having considered these five means of communication, it is easy to see that each of them offers special advantages, so that for many things it cannot be well replaced by any of the others; it is therefore not reasonable to suppose that one or two of them will absorb and supersede the others. None of them have attained the degree of perfection of which they are capable. If they had, the cost of conveyance of goods would not increase their value four or five fold, as is frequently

the case. Coal worth seven or eight shillings a ton at the pit's mouth is worth twenty or thirty at 200 miles distance.

It is argued against canals and in favor of railways,

1. That the cost of haulage is not much greater on railways than canals.

2. That railways offer such great advantages in point of speed as to compensate for increased cost of conveyance.

3. That it is quite practicable to convey on railways bulky goods, as building materials or minerals.

4. That if the profits derived by the conveyance of bulky goods are not very considerable, still the traffic can be absorbed, because a handsome profit is realized from the passenger traffic.

5. Puplic opinion is in favor of railways.

6. All canal property has lost a great deal of its value since the opening of railroads.

7. The continually increasing traffic on railroads proves that the public prefer that mode of conveyance for goods.

8. Canals are frozen, consequently impassable, for a certain length of time every year.

The first argument, that of cheapness, is not exact; up to a speed of about $4\frac{1}{2}$ miles an hour the resistance on canals is, as we have seen, inferior to that on railways. The cost of establishment and that of repairs and management on canals are also inferior. The use of condensing engines and coal fuel render the cost of the moving power less by water than on railways, so that a speed considerably above $4\frac{1}{2}$ miles per hour may be attained at a cost still inferior to that of railways.

The second argument is granted, but only with certain materials. Builders and contractors frequently order building materials and minerals three, four, and six months beforehand, without any inconvenience, and they have the great advantage of loading and unloading when it suits them; whereas with railways, space being valuable, all goods must be removed at the shortest notice, or else heavy dues must be paid for leaving the goods at the station.

Among the articles for which canals seem eminently convenient are the following:

Bulky articles—timber, bricks, stone, large castings.

Fragile articles—glass and pottery not packed in cases.

Articles of small value—ore, minerals, ashes, manure, &c.

Thirdly. It is very doubtful whether railways could furnish the sole medium for the conveyance of bulky articles. To do this the goods trains must travel at the same speed as the passenger trains, to the sacrifice of that important item of economy in the working of steam engines, expansion; if not, a third line must be laid down at a vast cost, for the sole transit of merchandize, or else the lives of passengers must be daily jeopardized to an extent far greater than what we observe even at present.

Fourthly. M. Perdonnet says that in may cases—as in that of the

French Northern Railroad, those of Rouen, Strasbourg, and Orleans, that from London to Birmingham and from London to Bristol—the profits derived from the conveyance of passengers and parcels suffice to pay the interest of the capital and the general expenses, so that the companies can content themselves with very small profits on the goods traffic. This is open to discussion, for it is very difficult to separate the passengers and the goods account so completely as to tell exactly what are the profits relative to each.

Fifthly. Public opinion is no criterion. There are many reasons why railways should attract public attention more than canals. The convenience in traveling, the wonderful speed, &c.

The sixth argument cannot be denied; but too much importance must not be given to it. Suppose, instead of constructing railroads parallel to those canals which have most suffered as a property since their establishment, we had established parallel lines of navigation,—would not the results have been very similar?

As to the seventh argument, it is refuted by observing that in France and Belgium the traffic on canals has gone on increasing since the establishment of railways parallel to them.

Eighthly. The effects of frost can only be palliated; but I think they are not more incovenient than a heavy fall of snow in a railway cutting, and are much less so than an interruption in the permanent way.

All these arguments therefore can only prove that canals have a severe struggle to keep up with railways. I will add in favor of maintaining, extending, and improving our canal navigation, that the public, whose attention has been entirely absorbed by railways, has neglected the vast field for improvement offered by canals in general, and by those of England perhaps more than any other.

How the struggle between railway and canal companies is to end is diffiult to say. United action on the part of the canal proprietors will be beneficial, and a community of interests between the canal owners and carriers will be still more so.

Attempts have been made to connect canals with irrigation of land, or with works for the supply of water, or with hydraulic machines for manufactures. The Canal de l'Ourcq, at Paris, serves both for the purposes of navigation and water supply.

As to irrigation and hydraulic machinery, they may in some cases be made a considerable source of income to the canal owners; but more generally all the water is absorbed for the wants of the canal.

Improvements suggested with reference to Canal Engineering and Navigation.

The first step towards improvement is the application of steam power to the exclusion of any other. The advantages offered by the use of steam, are:

1. *Economy.*—It is impossible to give any absolute estimate of the cost of conveyance with steamers and horses. The cost of steam power in particular is very variable; but the following estimate will give an

of the difference in the working expenses, exclusive of loading and unloading and general expenses, which are nearly the same in each case.

Suppose it be required to convey 60 tons 100 miles.—A boat hauled by one horse will perform the distance in 48 hours.

	£	s.	d.
The horse and driver at 6*d*. per mile will cost, . .	2	10	0
Wages of crew, two days, . . .	1	0	0
Interest and wear and tear of boat, . . .	0	2	0
	£3	12	0

A steamer with engines of 16 to 20 H. P. can convey 60 tons 100 miles in 20 hours. The cost will be about as follows:

	£	s.	d.
Coal, 2 tons at 15*s*., ...	1	10	0
Wages of crew, one day, ...	1	0	0
Interest and wear and tear of engines and boat, . .	0	5	6
Oil, &c., ...	0	3	0
	£2	8	6
Difference in favor of steam power,	1	3	6*

Or nearly ·005*d*. per ton per mile.

2. The facility of increasing momentarily the moving power by reducing expansion and raising the pressure.

3. That of conveying indefinitely large quantities of goods according to the power of the engine, an object which cannot be attained with horses.

4. That of being perfectly self-dependent, whereas horses constantly occasion difficulties.

5. That of allowing the towing-path to be suppressed, causing a very great saving of space in deep cuttings and tunnels, which may thus be made available in other ways.

6. Saving of time. Any speed within 15 miles an hour is easily attainable, instead of 2 or $2\frac{1}{2}$ miles, which is the pace of horses; but 4 or 5 miles an hour appear to be a good average.

Suppose a boat towed by horses to convey in one trip 60 tons to a given distance, and 30 tons back: the carrier will gain, say 20*s*. for the first trip, 10*s*. on the next; total, 30*s*.

The steamer will probably make two trips in the same time, conveying twice 60 tons to the same place, and twice 30 tons back. The boatman can make the same charge on each trip, and gain £3. But he will probably content himself with £2, thus sharing with the public the benefits derived by the improvement; and in any case a saving in time for the public will be effected. The number of boats forming the rolling stock will be diminished by half.

The next step is to introduce the *train* system. That towing is cheaper than carrying has been demonstrated more than once by actual

* This is so printed in the original, but it evidently should be £0 13*s*. 6*d*., or nearly ·0033*d*. per mile.

experiment. I have shown before that at a given speed the length of the boat makes very little difference, the area of the immerged transverse section having the most influence on the resistance, so that with an indefinitely long vessel the cost of traction would be but little increased: as this is impracticable, we must obtain an approximation by the use of boats towed one astern of the other. This system has been long in use in America. The introduction of steam necessitates certain alterations in the dimensions of canals: first, the section of the canals and the dimensions of the locks must be increased.

(To be Continued.)

For the Journal of the Franklin Institute.

Mid-Lothian Coal Mines, Virginia.—Cornish Pumping Engine, &c.

By Joseph Buzzo, M. E.

The mines of the Mid-Lothian Coal Mining Company are situated in Chesterfield County, thirteen miles from Richmond, and a half a mile from the Richmond and Danville Railroad—a branch track from that road connects the mines with their shipping point, opposite Richmond.

This Company has been formed and in successful operation for about 20 years. They now own about 2000 acres in the heart of the Chesterfield bituminous coal basin. The coal is considered of superior quality for gas, grate, and forge purposes, and finds a ready market. The average thickness of the seam of coal, varying from 4 to 50 feet, may be estimated at about 20 feet. Several vertical shafts varying in depths from 550 to 771 feet have been sunk through the vein at different points, and communication effected from one to the other, which gives good ventilation to the underground workings.

By the aid of three large hoisting engines they are able to raise a large quantity of coal. The Company are now engaged in sinking a new shaft near the centre of their ground, which they expect to complete in twelve months; and which, when completed, will open to them an additional valuable field of coal. About two years ago this Company leased a small piece of land adjoining their mines through which, than from any other point, coal could be more advantageously raised; and drove a drift into what was considered an unwrought piece of coal, when suddenly they cut into an old drift connected with extensive underground workings filled with water. This communication was at the highest point of the Company's workings; and as the old workings cut into were connected with vertical shafts 4 or 500 feet deep, and filled with water, the force with which the water poured into their works was enormous. It swept away thousands of the timbers in its route, washed up the railway tracks, knocked down large quantities of coal, in a few minutes filled the workings, and stood 40 feet above the drifts in the principal vertical shafts. This accident occurred fortunately

about midnight, when only 15 hands were below, ten of whom were lost. Previous to this the water had been kept out of the mines by large buckets fixed in cages and worked by the hoisting engines at night; but now so large a quantity had come in at once, and additional feeders having been cut, it was found that the whole power of all their hoisting engines, working day and night, was only sufficient to keep the water at bay, and that some additional power would be necessary to free the mines.

By taking accurate measurements of the buckets, and keeping an account of the number raised, it was ascertained that the quantity coming in in 24 hours was about 220,000 gallons.

It was determined to erect a pumping engine of sufficient power to drain the whole of the workings, leaving the hoisting engines for the exclusive purpose of raising coal.

After due investigation by the Directors in regard to the best kind of pumping engine now in use, in the course of which, advice was taken from various engineers, it was finally, only on the urgent recommendation and by the advice of Wm. W. Wood, Esq., Chief Engineer, U. S. N., that it was decided to erect a Cornish pumping engine, of the most improved kind. Proposals were invited from the principal foundries of the country for building such an engine. Those of Messrs. Merrick & Sons, engineers, and proprietors of the Southwark Foundry, Philadelphia, were accepted, and preparations immediately commenced at the mines for erecting the machinery. Here many difficulties presented themselves. All the fixtures and pit-head had to be removed, and it was then ascertained that the curbing timbers of the shaft would have to be renewed.

This was a work of difficulty and danger, for the soft nature of the materials near the surface caused the sides of the shaft to cave in as soon as the old timbers were removed. Great precaution had then to be exercised in saving the shaft and protecting the workmen. It was accomplished in five or six months without any injury to the men, and the shaft re-cribbed with foot square timbers.

The foundation of the engine house, which is within a few feet of the shaft, had to be quite deep, and from its great weight it was feared it would crush in the sides of the shaft. To prevent this, heavy timbers, 20 inches square and 28 feet long, were placed below the foundation between it and the shaft, and extending eight feet on each side of the shaft into the solid earth.

The foundation is of granite about 20 feet deep, the cylinder pillar of the same material and depth, and 17 by 24 feet. The beam (or bob) pillar, which is the front wall of the engine house, is of the same material, 24 feet wide, 6 feet thick to surface line, and 5 feet thick above that line, and 27 feet 6 inches above the surface. The rest of the engine house is of brick, with walls 34 inches thick. The boilers are in a separate house, in the rear of, and connected with, the engine house.

The engine is a "beam Cornish." Its cylinder is 60 inches diameter with 10 feet stroke of piston. The piston is packed with a single cast

iron ring, bored eccentrically and slit and tongued on the thinnest side; being kept central and in contact by four springs. The beam is of equal lengths, 28 feet 6 ins. from centre to centre of end pins, having wrought iron catch-pieces. It is double, and besides being of the usual proportion for strength, is banded by heavy wrought iron bands on the upper side, put on hot, and extending from under side of bosses around them, and over horns cast with the beams on their upper side. The total weight of the beam and centre shaft is 19 tons.

The cylinder is, of course, steam jacketed and cased as usual. The valve gearing is of the most improved kind, and for the purpose of gaining room, the exhaust chest is on one side of the equilibrium pipe, which is central. The exhaust pipe is carried through a trough supplied with cold water from the condensing cistern. There are two cataracts, one being applied to regulate the opening of the equilibrium valve. The steam arm passes through a slot in the (single) plug-rod, and is shut by a curved tongue piece, whose position is controlled by a regulating screw, of length sufficient to give the requisite variation in cutting off. The valves are opened by weighted pistons moving air-tight in cylinders on the cataract floor. The air pump is 26 inches diameter, 5 feet stroke, dipping into the condenser, and having in its bottom a grating carrying a circular gum foot valve. The bucket valve is also of gum; the delivery valve a cast iron float faced with wood. The injection valve is provided with a "wing throttle," opened and closed with the exhaust. The vacuum attained is 28 inches. The condenser and greater part of the air pump are immersed in the condensing cistern, and covered with water. A balance bob is on the surface connected to the main rod.

Steam is furnished by three single flue boilers, 6 feet diameter, 26 feet long, set below ground level. The flue is 45 inches diameter, containing at the firing end the grate, which is 6 feet 9 ins. long. The heated gases passing first through this flue, return at the sides to the front end, descend and pass under the bottom with the connecting flue to the chimney. This connecting flue contains a heater 30 ins. diameter, 28 feet long, through which the feed water passes before entering the boilers. Over the front end is a steam drum 30 inches diameter, 13 feet long, connected by pipes to stop-valves in each boiler, and from which rises the main steam pipe. The boiler shells and flues are of three-eighth-inch best Pennsylvania plates. The heads are of half-inch plates.

The chimney is 4 feet square in the flue, 70 feet high.

The feed water is supplied from an adjacent spring by a steam pump, the Mine water being too much impregnated with mineral substances.

This engine has been erected upon one of the deepest vertical shafts on the concern, which is 770 feet deep. The pit-work consists of three plungers and one drawing lift, each 10 feet stroke; the whole of them are of the same size bore, being 14 ins. diameter, as all the water accumulates to bottom. The main rod is of Pennsylvania pine; the first, 240 feet from nose of the bob, is 16 ins. by 14 ins.; the next 240 feet is 14 ins. square; and the remaining 240 feet is 12 ins. square—thus

making the entire length of main rod 720 feet. These rods are joined together by scrap-iron strapping plates 16 feet long, with 16 screw-bolts in each plate, and each joint having 4 plates. These rods are supported the whole length in guides (or stays) not exceeding 30 feet distant; these guides are of wood, 7 ins. by 10 ins., fastened into the wall of the shaft, and are held together by screw-bolts and iron glands, which at any time can be easily adjusted. At each set of those guides the main rod is protected by thin hard wood linings, and held to the rod by quarter glands screwed. Each plunger pole is screwed to the main rod by eight strong iron staples and glands, with a filling piece of wood 9 inches thick—the upper end of the stock works through a set of guides similar to those on the main rod. The main rod has four sets of catches, 3 of these on the down stroke and one on the up stroke of the engine, which prevents the whole machinery traveling beyond a given length of stroke in case of accident.

The foundation for each plunger consists of ten pieces of pine 12 ins. deep, fastened into the walls of the shaft in front of the main rod. And at one side of the rod cross timbers are again built upon these, four feet wide and five feet deep, fitted very snugly together, constituting fifteen feet of solid timber under the cistern, thereby preventing any spring or motion in the plunger or column on the turn stroke of the engine.

The stuffing-boxes are packed partly with Russian yarn and partly with gum; either of these alone was found not to answer so well.

The construction of the clacks introduced here, are what are commonly called the Gribble clack, consisting of a cast iron shell or lid, 1½ ins. thick, having a hinge which works upon a pin or bolt, supported by two loops fastened to the outer part of the seating. This hinge lifts about 2 ins. in the loops at every up stroke of the water. The shell has a groove one inch and a quarter deep by one inch wide all around, shaped to the face of the seat; in this groove four slips of sole leather are fastened on their edge, leaving a projection of ¾-inch for a beat upon the seat. The water ways through these clack seats and throughout the entire columns are the same in diameter as that of the plungers. Some of those clacks have been at work over six months without being re-geared.

This engine was started to work towards the latter part of last May, and in a few months drained the mines some 300 feet to the present working level, and the raising of coal has been resumed with vigor.

The usual speed in draining, was from 5 to 7 strokes per minute. At present the mine is kept clear by working at 4½ strokes about one day in six.

This is the first *pumping* engine of the kind which has ever been erected in this State. She works in admirable order, and for material and workmanship reflects great credit to the builders. The Company are moreover entitled to great credit for the foresight shown in providing in the erection of this engine a surplus power which will enable them to extend their operations to almost any extent. The hoisting engines are of the ordinary kind of high pressure, and coal is raised

by the cage and guide rods, with 4-wheel boxes which carry half a ton of coal in each box, and when at full speed it is estimated to raise sixty of those boxes per hour with each engine.

In view of the wide extent of territory, the superb machinery erected, and other facilities for making large and profitable returns, this Company may congratulate themselves as only on the eve of doing a wide and profitable business for many years to come.

AMERICAN PATENTS.

List of American Patents which issued from October 5 to October 26, 1858, (inclusive,) with Exemplifications.

OCTOBER 5.

1. Steam Boiler Furnaces; James Alcorn, Jr., Charlestown, Massachusetts.

Claim—1st, The arrangement of the chambers with their respective passages communicating with the smoke-stack, and the passages and the chamber communicating with the ash-pit. 2d, The arrangement of the cone pipe with its deflecting cover and the pipe, in combination with the chamber arranged in rear of, and communicating with, the ash-pit.

2. Gate; Silas Allington, West Dresden, New York.

Claim—The lever with its self-shifting weights, and its connexion to the gate, in the manner set forth.

3. Fly Trap; Bryan Atwater, Berlin, Connecticut.

Claim—As a new thing or manufacture, a fly-catcher, constructed with the notch or passage, arranged with respect to the upper edges of its side and two ends, and so as to operate substantially as described.

4. Animal Traps; Moses H. Biddle, Mount Carmel, Illinois.

Claim—The combination and arrangement of the pivoted bar, spring detent, and the spring catch. Also, the arrangement of the spring pulley, cord, and axis, of the revolving platform of a rat trap in combination, for the purpose of effecting a prompt revolution of the platform as soon as the detent is disengaged.

5. Rolling Window Blind; S. W. Bidwell, Hartford, Connecticut.

Claim—1st, So hanging the roller upon which the blind is hung, that it shall traverse in a horizontal plane (or nearly so), by means of the racks and toothed journals, or their equivalents. 2d, In connexion with the above, the combination with a rolling blind of a weighted cord, arranged with a helically grooved pulley on the end of roll, or in any other way substantially the same, for the purpose of counteracting the weight of the blind. 3d, The combination with the traversing roll of a weighted self-adjusting "friction fixture," consisting essentially of a weighted case and inclosed pulley. 4th, So arranging the tapes of a rolling blind with the shaft on which the slats are wound, that the slats may be shifted by the partial rotation of said shaft.

6. Slate Pencil Sharpener; William Burnet, City of New York.

Claim—The manufacture of a pencil sharpener made of inclined cylindrical rods having raised teeth upon them, either in the form of screw threads or sharp parallel ridges, and the attachment of these to any suitable plate or frame work of metal for securing the cylindrical bars or rods in their proper position, and for securing the whole to the frame work of the slate.

7. Screw Propeller; Oliver Byrne and J. G. Elliott, City of New York.

Claim—The device and method described, or their equivalents, for conducting useless or superfluous water to the rear of a screw propeller in immediate contact with the blades aft, not for the purpose of giving a rotary motion to the propeller, but for the purpose of diminishing what is termed "slip," by the operation and methods described.

8. Deflecting Plates for Circular Saws; J. D. C. Carpenter, Cincinnati, Ohio.

Claim—1st, The rotary deflecting plate or spreader, provided with an adjustable friction bearing, as set forth. 2d, The cutters placed near the margin of the deflecting plate, substantially as set forth.

9. Carpet Stretcher; W. S. Cowant, City of New York.

Claim—A carpet stretcher made by combining the clamp and wedge with the other necessary parts of a carpet stretcher, as set forth.

10. Lubricating Car Axles; John W. Cochran, City of New York.

Claim—In connexion with the spring and wheel, the inclined diaphragm, having the space for the play of the wheel, and access to the wheel and spring, as described.

11. Washing Machine; Samuel W. Cole, Millington, Maryland.

Claim—The combination of the lever, E, shaft, C, and hinged levers, b b, with each other and with the rubbers, for the purpose of moving said rubbers in contrary directions at the same time, and allow the upper rubber to rise and fall, to adapt itself to the clothes.

12. Cam for Throwing Bolts in Locks; Henry W. Covert, Rochester, New York.

Claim—The combination of the cone or wedge-shaped centre with the socket or outer rim, to form a cam for throwing the bolt to the lock.

13. Fog Signal Machines; Joseph D. Custer, Norristown, Pennsylvania.

Claim—The application to fog signal machines, magnetic telegraph registering machines, &c., of my improved retaining power, including pinion, I, wheel, J, shaft, K, pinion, L, wheel, Q, click spring, and balance piece, when arranged to form an adjustable and durable retaining power.

14. Knives to Cut Paper Bags, &c.; Henry R. Davis, City of New York.

Claim—The serrated knife having a vertical movement, in combination with the narrow slot in the bed plate for sustaining the paper while several thicknesses are being cut for bags or other irregular forms, as set forth. Also, forming said serrated knife with alternate long and short serrations, for piercing and cutting several thicknesses of paper.

15. Railroad Switch; Charles C. Dodge, Marshall, Michigan.

Claim—The application and use of the combined arrangement of the grooved or threaded cylinder, lever, guide pin, pivoted target staff, pin tie bar, and box, for the purpose set forth.

16. Folding Guides; Alexander Douglas, City of New York.

Claim—The peculiar flattened tube, folded upon itself, as described, so as gradually to fold the enclosed material along three lines, and at the same time to support it on all sides, and preserve its stiffness at all other points, substantially as described.

17. Carpet-Sweeper; Jacob Edson, Boston, Massachusetts.

Claim—1st, The arrangement described of hanging the brush at or near one of its journals in a bridle, and attaching the opposite end of the said bridle at a point on the case of the machine between the centre of the driving-wheel and the other journal of the brush, whereby the machine is made self-adjusting, so as to adapt itself to heavy or light sweeping. 2d, Attaching the handle of the machine to the bridle at a point near the driving-wheel instead of in the centre of the machine. 3d, Forming the entire machine of a tapering shape, as described, whereby the brush can work successfully in the corner of an apartment to be swept. 4th, The combination of the revolving brush, having the bristles arranged spirally thereon, with the tapering shaped dirt-receiver, so as to sweep and convey the dirt into the larger end of the receptacle. 5th, Combining in one the door for removing the dirt and the dirt receiver, by constructing it as described.

18. Steam Plough; James W. Evans, City of New York.

Claim—1st, The combination and arrangement of the main shaft and cranks, forming part thereof with the main axle and driving-wheels, by means of screw shaft, and the bevel, and the screw thread upon the axle, so that by the action of the piston rod attached to crank, the reciprocating action is communicated to the ploughs, and at the same time the machine is moved forward in due proportion to the stroke of the ploughs by the rotation of wheels, and thereby cutting a continuous furrow by a rectilinear and direct thrust of the plough or ploughs. 2d, The construction and arrangement of the supports or guide pieces, the pairs of vertical rods, operating by means of the eccentric, and the lever and arm, in the manner described, for guiding, securing, elevating, and lowering the plough.

19. Grain Cleaning Machine; W. T. Fisher, Cleveland, Tennessee.

Claim—The oscillating blast and screen spout, scourer, blast spouts, and fan, combined substantially as set forth.

20. Rolling Railway Iron; John Fritz, Johnstown, Pennsylvania.

Claim—So arranging of "three high" rolls for railroad rails, bars, or beams, as that said rails, bars, or beams may be rolled or reduced as they pass both forward and back, and so that each succeeding pass shall roll down the fire formed at the preceding pass, and avoid any necessity of turning the bar as heretofore done. Also, in combination with the top of the series, or with any roll of a series which performs its duty, the yielding clearer or guide, or its equivalent, for preventing the bar, rail, or beam from winding on said roll.

21. Cotton Scrapers; C. A. Gaines, Watson, Mississippi.

Claim—Giving a hollow or concave form to the bottom of the block from the rear and side edges inward, and forward to the mould-board or scraper.

22. Gas Metres; Joseph E. Fisk, Salem, Massachusetts.

I do not claim the employment of two flexible bellows in two separate chambers. Nor do I claim the mode of constructing the flexible bellows, as exhibited in the United States patent numbered 9591, wherein such bellows is made of two metallic shallow dishes or partitions joined at their edges by a flexible connexion. This differs essentially from my invention, wherein a sack, I or J, separate from and arranged within a flexible enclosing case, M or N, is employed, as in my invention the sack alone constitutes the gas-receiving chamber, and can be readily removed from its flexible case whenever necessary, without requring the enclosing case to be removed from the metre.

Claim—The described improved arrangement of the partition, K, and the shaft, D, the cranks, valve, C, and valve seat, B, with respect to the chambers, E H and A, and the pipes or passages, a b c d, the same enabling one shaft, D, only necessary to the operation of the valve by the two sacks, I and J. Also, combining with each flexible sack, I J, a flexible enclosing case, M or N, arranged so as to operate therewith, as specified. Also, the arrangement and application of the pipe, F, with respect to the valve, C, and the case of the metre, the same being in manner and for the purpose as specified.

23. Hay Rakes; Peter Fitzgerald, Constantine, Ohio.

Claim—The combination of the shafts, and the clutch, and brake, with the levers, bar, handle, and cam, for the purpose of putting the brake and clutch in operation, as described.

24. Washing Machine; John Fordyce, Morgantown, Virginia.

Claim—In combination with the reciprocating plunger, the tipping rack, and the stationary rack teeth, the three parts operating together in the manner set forth.

25. Gearing for Cut-off Valves for Steam Engines; P. W. Gates, D. R. Fraser, and Thomas Chalmers, Chicago, Illinois.

Claim—Working the cut-off valves, D D, in combination with a main slide valve or separate main slide valves of the character described, by means of the pawls, k k′, to lock the cut-off valves with the main valve or valves in an open condition, the variable or adjustable slides, p p′, to disengage the said pawls, the stops, 3 3, to stop the said cut-off valves in a closed condition after their liberation, and stops, y y y y′, to stop and open them by the completion of the stroke of the main valve or valves.

26. Sewing Machines; Wm. O. Grover, Boston, Massachusetts.

Claim—1st, The combination of a cylinder, and plunger, and needle of a sewing machine, in the manner specified. 2d, A slot, or its equivalent, for the purpose specified, in combination with the guiding mechanism of a sewing machine needle.

27. Sewing Machines; Wm. O. Grover, Boston, Massachusetts.

Claim—1st, The combination with a curved needle or hooker-on. or looper, of an irregularly shaped spiral shaft and a reciprocating driver, both substantially such as before specified, and constituting an apparatus for imparting the required motions and pauses to a crooked needle. 2d, Mounting a driver, combined with, and acting upon, a spiral shaft, with a spring or springs. 3d, Combining such springs with layers of raw hide, leather, or similar material, when acting upon, and in combination with, a spiral shaft. 4th, An actuating surface, so formed as to surround or embrace an irregular screwed shaft, and at the same time free to slide in a driver, in planes perpendicularly, or nearly so, to such a shaft.

28. Sewing Machines; Wm. O. Grover, Boston, Massachusetts.

Claim—The combination of a spring, a bar attached to or making part of a slide and resting upon a cam, and a cam shaped substantially as specified, when these parts are held in working position and connexion by the spring, as there is no attachment between the bar and the cam, all these parts being substantially such as are before described, and acting severally and in combination, substantially in the manner specified.

29. Sewing Machines; Daniel Harris, Boston, Massachusetts.

Claim—Driving the needle arm and the apparatus for effecting the feed and for forming the loops in sewing machines, by means of a pulley provided with an india rubber ring. or its equivalent, and hung in brackets cast on to the bed plate, in combination with a fly-wheel also hung in brackets, but which are attached to the table, said pulley and fly-wheel being arranged in relation to each other, so that they may be readily thrown into or out of working contact, as set forth. Also, the peculiar construction of the hollow goose neck, when so shaped as to admit of the insertion of a bent needle arm, and the vibration thereof upon a fulcrum within said goose neck, in the manner specified. Also, for feeding the cloth. or other substance, in sewing machines, the feed hand connected by means of a yielding joint with the slotted plate containing the slide, and forming therewith a parallelogram opening in combination with a vibratory needle stock having a pin projecting into said slot, so as to operate in the manner described.

30. Carpet Sweeper; Daniel Harris, Boston, Massachusetts.

Claim—The arrangement of a revolving brush driven by means of a padded driving-wheel from one side only within a semi-cylindrical casing, provided with stationary pockets and deflectors in front and rear of the said brush.

31. Haltees and Bridles for Horses; S. C. Hawkins, Patchoque, New York.

Claim—Forming the ring with a flanch, and securing the straps to the ring by rivets, which pass through the straps and flanch.

32. Machine for Cutting Laths; Reuben Haynes, Oberlin, Ohio.

Claim—The arrangement of the curved slot and lever, in combination with the revolving sliding shafts and gears, when arranged as described, for the purpose of raising and giving a throw to the log conjointly, and acting with the immediate gearing, in the manner described.

33. Construction of Animal Traps; Edmund Hill, Cincinnati, Ohio.

Claim—The ridge or step, in combination with the door and lever, for the purpose of re-setting the trap.

34. Baggage Checks; Edmund Hoole, Mount Vernon, New York.

I do not claim, broadly, stamping or engraving the names of the different stations on one plate or check, one at each side, for it is quite common to employ both sides of signs, slates, &c., for analogous purposes, and the mere employment of both sides of a baggage check for directory surfaces, even if practicable, would not be invention. Therefore, I

Claim—Stamping, engraving, or otherwise marking on the plate or check, A, the names of two different stations, one at each side, when said plate thus stamped or engraved is used in connexion with a strap, B, attached to the plate, and rendered capable of being adjusted as shown, for the purpose specified.

35. Packing Pistons for Steam Engines; Hanford Horton, City of New York.

Claim—The application of the figure 8, or other appropriate spring, between the upper and the lower set of metallic cylinder rings, as described, by which an upward and a downward pressure is obtained on said rings. I do not claim the application of springs to produce an outward pressure, said springs acting on a single or spring ring which keeps out the two cylinder rings, as that has heretofore been in use by others as well as myself. But I do claim the combination of the six rings, a 1 2 3, b 1 2 3, with the figure of 8, or other appropriate spring, between them to produce an upward and downward pressure, in combination with the figure of 8, or other appropriate spring acting on the two spring rings, producing an outward pressure on the four cylinder rings, thus making a steam tight joint on the upper edge of the upper cylinder ring, as well as on the lower edge of the lower cylinder ring, and also on the cylinder surface of the cylinder rings.

36. Photographic Baths: Bernhard Hufnagel, City of New York.

Claim—The construction of a silver bath for photographic and ambrotype purposes, made out of two plates of glass, with india rubber between, and fastened together between wooden or other frame work, in the manner described.

37. Hemp Brakes; Wm. C. Hutchinson, St. Josephs, Missouri.

Claim—The tooth, described and illustrated in the drawings, as constructed, to be used in the drums of cylinder hemp brakes. Also, the combination and arrangement of the pendant scalloped edge swingle, with the sliding or reciprocating double jaw hatchel, arranged and operated substantially in the manner described.

38. Harvesters; G. F. and Moses Jerome, Mineola, New York.

Claim—The guard formed with an oblique portion, in combination with the seat placed relatively with respect to each other and the platform, as described.

39. Valves for Steam Engines; Joseph Jobin, St. Maude, France; patented in France April 13, 1858.

Claim—The sliding balance valve, constructed of a prismatic or partly prismatic form, and guided in its reciprocating travel by and within a steam chest open or closed at its ends, but surrounding in a close manner the sides of said valve.

40. Apparatus for Raising Dough for Bread; Josee Johnson, City of New York.

Claim—The double brake, in combination with the conical shield, operating as described.

41. Ballet-Box; S. C. Jollie, City of New York.

Claim—The employment of a glass globe in the construction of a ballot-box, by mounting the globe as described, so that it shall be simply held in place without concealing the contents, and having a hole at top of sufficient size for the hand, which hole is to be provided with a hinged cover with a hole of the required size to drop the ballots through.

42. Card Clothing; Richard Kitson, Lowell, Massachusetts.

Claim—Constructing the teeth, so that when in place their points are below or less prominent than, and protected and guarded by, their thick parts or heels.

[This invention consists in so forming the pointed teeth of "card clothing" for cotton gins and wool-burring machines, that when the clothing is wound upon a cylinder or fastened to an endless belt, the points will be below the thick parts of the wires, and the thick parts of the wires will form smooth surfaces for the feeds or burrs to roll upon, and thus prevent them from coming in contact with, and being broken by, the points, and also the teeth from being damaged. By this intervention the only objection to the use of toothed surfaces for ginning cotton and burring wool, namely, the breaking of the seeds or burrs, and the liability of damaging the teeth are overcome.]

43. Water Alarm for Steam Boilers; Levi E. Lincoln, Lowell, Massachusetts.

Claim—1st, The application of an alarm whistle exclusively to the water space of a steam boiler to obtain controlling motive power, in conjunction with an application exclusively to the steam space of said boiler, to obtain warning or acoustic power. 2d, The application of a self-adjusting valve to the stem of a steam whistle, in manner such that a current may be intercepted thereby. 3d, The application to a whistle of a metallic tube or pipe, in such manner that unexpanded it shall be pendant from the whistle, and that by expansion and contraction it shall have the office to effect the operation of the whistle. 4th, The application of a set-screw, or mechanical equivalent, to an expansive tube, in such manner that the effective expansion and contraction of said tube may be prescribed thereby. 5th, The application of a whistle to its support, standard or frame work, in such manner that the whistle shall be suspended from said frame work by that portion of itself which extends upward from its bell. 6th, The holding of a valve seat in position for its valve by pendulous attachment by suspension. 7th, The operating of a valve seat upon its valve by the expansion and contraction of a metallic tube, or by the expansion and contraction of any mechanical equivalent thereof.

44. Spark Arresters; Joseph Marks, Boston, Massachusetts.

Claim—The combination of the petticoat pipe, the surrounding wire net work, and the smoke pipe, whereby, while a free exit passage is secured for the exhaust steam, an intermittent draft is produced upon the outer surface of the wire net work, which pulverizes the sparks and retains them until they are consumed, as set forth.

45. Mode of Transmitting Magnetic Signals on Railroads; Henry Maule, Philadelphia, Pennsylvania.

Claim—Securing to a railroad a series of conducting rails independent of those of the track, and placed in pairs, one pair being disconnected from the next pair throughout the series, and each pair of conducting rails being arranged to connect with a galvanic battery on the train by the devices described, or their equivalents, one rail of each pair to one pole and the other to the other pole of the said battery, and the latter being connected to any suitable indicating apparatus situated on the train, as set forth.

46. Bank Locks; L. H. Miller, Providence, Rhode Island.

Claim—1st, A series of slotted sliding tumblers within a sliding box, arranged in such relation with the bolt or bolt latch, that each tumbler will require to be adjusted separately, in order to allow the bolt to be shoved back, and the lock unlocked. 2d, The arrangement of the hollow arbor, rod, lever, and tube, with projection attached, in connexion with the notched disk and click, and a key, constructed as shown, or in an equivalent way, whereby the tumbler box is moved the correct distance for the several tumblers to be brought in line with the projection, and the several tumblers adjusted at each movement of the box. 3d, Operating the sliding tumbler box from the arbor, by means of the part pinion and the rack of the plate, arranged in such relation with the dogs, slide, and bolt, that by the time the tumblers are all properly adjusted, the dogs will respectively raise the latch and throw back the bolt.

47. Cultivators; B. S. Morgan, Delhi, Iowa.

Claim—The arrangement of the bars with share stocks attached, the levers with links fitted in the triangular shaped openings in said levers, and attached to the coulter bars which are connected to the levers. Also, in combination with the above, the brace rods, attached to the share stocks by means of the springs, and fitted in the recesses in the stocks.

48. Trip Hammer and Anvil; D. A. Morris, Pittsburgh, Pennsylvania.

Claim—The arrangement of a gang of trip or tilt hammers in connexion with the movable anvil, constructed in the manner specified.

49. Rolls for Making Sheet Iron; D. A. Morris, Pittsburgh, Pennsylvania.

Claim—The employment of mottled chilled iron rolls for rolling sheet iron, when constructed as described.

50. Distillation of Fresh Water from Salt Water; A. Normandy, London, England, a citizen of France.

Claim—The process set forth, by which ærated and non-ærated fresh water are obtained by distilling sea water.

51. Steam Water Tank; S. H. Yocum and J. O. Byrne, Shelbyville, Indiana.

Claim—1st, The extension of pipe, B, above the bottom and inside of tank, A, in combination with valve, C, and gauge, U, or their equivalents, in the manner set forth. 2d. The flexible pipe, D, and stop cock, G 2 and M, in combination with the plexus, O O, and air-tight tank, A, as set forth.

52. Apple-paring Knife; Adam Oat, Minetto, New York.

Claim—The combination and arrangement of the curved blade with its projecting end, and the guard or stock, as specified.

53. Windlass for Moving Cars and Locomotives when without Steam; Charles Page, West Meriden, Conn.

Claim—The combination of the windlass with the jaws and the levers, when arranged, and made to produce the result, by the means and in the manner described.

54. Tools for Manufacturing Goods of Caoutchouc; D D. Parmelee, City of New York.

Claim—The instrument or tool for cutting sheets of india rubber, or its equivalent, constructed substantially as described, consisting essentially of two jaws provided with cutting edges shaped according to the form

intended to be produced, when one jaw is to operate within the other so as to effect shear action, for cutting forms at one stroke and leaving edges thereon, which are capable of being united in a more perfect and expeditious manner than has ever been done heretofore.

55. Hay Rakes; M. Raezer, Reading, Pennsylvania.

Claim—The spring bar, the foot lever, and the gearing, arranged as described.

56. Water Indicator for Steam Boilers; M. Robbins and J. L. Frisbie, Cincinnati, Ohio.

Claim—1st, In the described combination with a customary steam alarm, the steam pipe, provided with a central screw, stem, and swivel, supporting the fulcrum of the float arm, in the manner set forth. 2d, In this connexion, we claim the small steam dome inclosing the branched pipe, valve, and lifter, substantially as set forth.

57. Machines for Cutting Root Grafts; S. S. Rockwell, Vermontville, Michigan.

Claim—The arrangement of the shanks, and blades, and movable blades, in the manner specified.

58. Carpet Sweeper; Stephen P. Rowell, Reading, Massachusetts.

Claim—In combination with the brush and its main operating gear, devices for adjusting the brush and maintaining its axis at the same or at its proper distance from the axis of the gear, in order to maintain the gear in engagement with its pinion, as specified. Also, the application of the rear dust receptacle to the frame, so as to be capable of being swung or turned upward and outward therefrom, for the discharge of dust.

59. Cooking Boilers for Ranges and Stoves; Joseph Schmadel, Dayton, Ohio.

Claim—A cooking boiler, provided with perpendicular tubes or flues around its sides, from the bottom upward, and opening into a horizontal flue or chamber around the top of the boiler, for the blaze and smoke to pass through.

60. Ticket Holders; Ira W. Shaler, City of New York.

Claim—The combined construction and arrangement of the body, holding bar, spring, and catch, substantially as set forth.

61. Wrappers for Cigars; James S. Suter and George M. Palmer, Baltimore, Maryland.

Claim—Taking pearl ash, powdered sal ammoniac, lobelia or Indian tobacco, oil of anio seed, oil of caraway, alcohol, grass, rope, rum, cascarilla bark, opium, sumac, and stems or refuse tobacco, and converting it into sheets for wrapping woolen goods to prevent moths from eating them, lining for cases for the same, covering for carpets, and wrappers for cigars or tobacco.

62. Apparatus for Tanning; A. C. Taggart and Alexander Gray, Alleghany, Pennsylvania.

Claim—1st, The arrangement of pivot, y, and links, x, as herein described. 2d, The use of the pipes, n, when placed near the top of the vats, and used in connexion with the pipe, o, as described.

63. Manufacture of Candles; Joel H. Tatum, City of New York.

Claim—Coating or covering candles manufactured of tallow or other inferior substance, with a plurality of compositions formed of stearic acid and tallow in varying proportions, together with proper fluxes to give different degrees of fusibility, and also certain degrees of hardness and smoothness to the same, substantially as described, the candles being dipped into the several compositions in the order of the sequences.

64. Lining for Coal Stoves and Furnaces; Wm. B. Treadwell, Albany, New York.

Claim—The employment of hollow blocks of metal, filled in with siliceous sand, as a new article of manufacture, to be used as a substitute in the place of fire-brick for the lining of the fire chambers of stoves and furnaces, substantially as set forth.

65. Machine for Numbering the Pages of Books; Edward and Calvin E. Town, Jersey City, New Jersey.

Claim—The use of type blocks containing a limited number of types, constructed as described, with the ratchet teeth at the side, or any equivalent device to secure their uniform motion. Also, the level bed pieces, as described, in combination with type blocks. Also, the mode of delivery of the type blocks, by means of the discharge boxes, as described. Also, the general combination of these parts with each other, and with the other parts of the machine.

66. Slides for Skirt Hoops; Wm. M. Warren, City of New York.

Claim—The slide composed of the two parts, formed as specified, and combined by a lock between the lapping portions of the hoop.

67. Machine for Trimming the Edges of Paper Hangings; John Waugh, Elmira, New York.

Claim—Rotating, concave, self-sharpening circular knives, whose shafts do not revolve in the same line, but at an angle to each other, giving the knives a pressure against each other, at the point of contact only—the reverse sliding motion of hopper and reel spindle, in combination with wooden roller, pulleys, and band and hand crank, in the manner set forth.

68. Apparatus for Manufacturing Fatty Acids; M. Werk, Cincinnati, Ohio.

Claim—The combination of boiler superheating furnace and tank, for the production of fat acids, without distillation or direct application of fire, as set forth.

69. Furnaces for Heating Buildings; John Plant, Assignor to self and George H. Plant, Washington City, D. C.

Claim—The mixing of all the heated products of combustion both below and above the fire cylinder, by an arrangement of diving and ascending flues leading into common chambers, where they cross each other, and are forced to commingle, substantially as described.

70. Cotton Gins; A. Q. Withers, Byhalia, Mississippi.

Claim—The curved spring board situated in the "roll box," and provided with teeth projecting from its lower edge, arranged as specified. Also, the employment of the additional brush and carding saws, situated between the ginning saws and discharging brush, and acting in combination therewith substantially as described. In combination with the additional brush and carding saws, I claim the concentric screen and "break currents," when arranged in close proximity to said brush and saws, and for the special purposes set forth, in connexion with their action.

71. Roach Trap; Alexander N. Shell, Assignor to Wm. S. Wood and Thomas N. Shell, Richmond, Virginia.

Claim—The centre bait pan, in combination with the annular ring, when located as shown.

72. Hay Rakes; George Whitcomb, Port Chester, New York.

Claim—The arrangement of the treadles, lever, rake head, arms, bar, joints, and adjustable rope, substantially as set forth.

73. Seed Drills; W. Irvin Willitts, Milton, Indiana.

Claim—The arrangement and combination of the corrugated roller, the adjustable frame, receding drill ploughs, the supporting chains, and the hooks, all arranged as described.

74. Machine for Stamping Trade Marks on Cloth, &c.; Algernon S. Wright, Lawrence, Massachusetts.

Claim—The arrangement and combination of the reciprocating carriage or table, the stamping mechanism, the inking apron, and its vat or trough, as made to operate together substantially in manner as described. Also, the combination of the stamp connexion bar and the spring, as applied to the lifter rod and the stamps. Also, the peculiar means or combination for operating the stamps, viz: a mechanism for lowering them gradually toward the apron, a mechanism for allowing the stamp to fall by the force of gravity upon or toward the table, mechanism for elevating the stamp off the table as well as off the apron, as described, and mechanism for maintaining the stamp at rest during each movement of the bed or carriage, the whole being in one cam as applied to a lifter bar, as described.

75. Ice Pitcher; James H. Stimpson, Baltimore, Maryland, executor of James Stimpson, deceased, late of said Baltimore, Maryland.

Claim—The treble wall for ice pitchers, as set forth.

76. Machine for Crozing, Chamfering, and Beveling Barrels; Wm. M Arnall, Assignor to self, O. P. Smith, and A. C. Jordan, Sperryville, Virginia.

Claim—Not the employment of several tools, but the arrangement of the adjustable croze and howel blade, with the stationary beveling blade and chamfering tool, when the same are constructed and operated in the manner specified.

77. Construction of Aquaria; John Chilcott and James Scrimgeour, Assignors to selves and George F. Taylor, Brooklyn, New York.

Claim—The combination of the dovetailed tenons or tongues, and acute angular plate sliding over the same, with the outer triangular plate and ends of the plates of glass for forming a space or well between the same for the reception of the cement, and thus enabling a perfect water-tight joint to be formed at the corner of aquarea and other vessels.

78. Machine for Planing Wood; C. B. Cottrell, Assignor to self and Nathan Babcock, Westerly, R. I.

Claim—The rotating cutters and central stationary gauge, in connexion with an adjustable gauge, or its equivalent, arranged to operate as set forth.

79. Artificial Leather; Wm. K. Hall, West Hoboken, New Jersey, Assignor to Amos Broadnax, St. Louis, Missouri.

Claim—The combination of the chemical constituents of leather, or their equivalents, substantially as described, for the purpose of forming a substitute for leather.

80. Sewing Machines; Joseph E. Hendrick, Assignor to self, W. H. Nettleton, and George Stevens, Bristol, Connecticut.

Claim—The shears, handles, or bowls, in combination with the upper part or blade acting as a needle carrier, and the lower part formed as a bed, whereby the sewing and feeding mechanism is actuated by a motion of the hand similar to that of cutting with shears, as set forth.

81. Rollers for Calico Printing; John Hope, Assignor to self and Thomas Hope, Providence, R. I.

Claim—The copper shell, cast metal foundation tube, and with a mandrel connexion cast in the metallic shell or tube, and on an arbor or mandrel, in manner and of a material substantially as described.

82. Sewing Machines; Joseph White, Troy, New York.

Claim—Giving the looper its motions for catching, spreading, and holding open the loop, and then delivering it up to the needle without putting any twist in the thread, by means of a shaft having two motions at the same time, and given to it by mechanism, substantially as described.

83. Machine for Forming Barrels, &c.; Jacob Rees, Assignor to Jonah L. Rees, Elkhorn Grove, Illinois.

Claim—The construction of the cylinder, with the radial arms, and segmental parts, and disks, the circular clamps, and guide bands, the suspension devices arranged and operated as described.

84. Railroad Car Seats; Draper Stone, Milwaukie, Assignor to self and E. S. Turner, Grafton, Wisconsin.

Claim—1st, Providing the back frame of the high back seats with hinged cushioned frames at different or the same points of elevation, and jointing the front ones of them to horizontal bars secured to the back frame, and attaching and combining therewith bracing or supporting bars and slotted bars, in which their curved ends move in such a manner as to enable the said cushioned back frames to be folded together with the back frame between them, to form comfortable and distinct reversible seats, or raised and extended to the high back seat frame next in advance to form sleeping berths or couches on different horizontal planes. 2d, The combination and arrangement of the double hinged cushioned back frames of the low back seats, with and in the relation to the double hinged cushioned bottoms, curved bar, and spring notched bars attached thereto, and horizontal ledges or ribs on the sides of the uprights of the frame, substantially in the manner set forth. 3d, Giving a greater elevation to the hinged cushioned double back and bottoms of the low back seats, by combining therewith the pins or studs on the edges of the former lugs or projections in which they rest, and rock shaft, and bars or arms attached thereto, and spring notch bars, and lugs or projections in which they rest, and rock shaft, and bars or arms attached thereto, and spring notch bars, and lugs or projections on the high back seat frame next in advance.

85. Gas Burners; Junius F. Tozer, Assignor to George W. Gregory, Binghampton, New York.

Claim—The application to the common gas burner of the two or three way turning cock, for the purpose set forth.

86. Saw-gummer; Harvey R. Wolfe, Assignor to self, David Staples, and W. H. Watson, Consolation, Ky.

Claim—The arrangement and combination of the stone, adjustable beams, screws, slots, and carriage, as set forth.

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87. Revolving Fire Arm; Thomas R. Austin, City of New York.

Claim—1st, The main spring attached to or formed on the trigger, whereby the pull on said trigger strains the main spring, as set forth. 2d, The sliding centre pin, I, shield, H, pin, H′, and toggle joints, when com-

bined with the latch for disconnecting the pin, I, as described. 3d, The double-acting spring, fitted and acting as specified, to return the sere and trigger, and parts attached to their quiescent position.

88. Hot Air Cook's Stove; Joseph M. Babcock, Albany, New York.

Claim—The combination of the double top, the perforated side plates, and the elevated oven, the same being arranged in the manner described.

89. Method of Adjusting Window Blinds; W. H. Babcock, Homer, New York.

Claim—The sliding spindle or arbor for alternately engaging the two mechanisms which severally move the slats and open the shutter, so as to operate either mechanism by the same handle.

90. Gas Burners; Yarnall Bailey, Philadelphia, Pennsylvania.

Claim—The mode of producing a flame, the extent of which may be increased or diminished at pleasure, by means of the adjustable heater, in connexion with the tube and the burner, as described.

91. Water Closet; Frederick H. Bartholomew, City of New York.

Claim—1st, The use of a drip box or leak chamber, arranged above the closet and below and around the supply cock. 2d, Arranging the supply cock upon the cover of the closet, whether the drip box be employed or not. 3d, The adjusting screw, the cam, and the lever, or the equivalent thereof. 4th, The laterally adjustable standard, substantially as described.

92. Hinge; Mathias Bettinger and August Boos, Cincinnati, Ohio.

Claim—The described arrangement and combination of the lugs and horns, for the purposes set forth.

93. Grain Drills; Samuel Binkley, Dublin, Indiana.

Claim—The slide, in the described combination with the grooved or corrugated staple, for the purposes set forth.

94. Car Couplings; George S. Bishop, Washington City, D. C.

Claim—The loop bolt or pin, B, in combination with the slots, H and L, and slide block with grooves. Also, the manner of supporting the loop bolt, by allowing the short arm to rest on the bumper head, as N, instead of resting on a block or ball, whether the slots, H and L, be separated or connected, when constructed in the manner set forth.

95. Escapement for Time-keepers; Josiah Bishop, Austin, Texas.

Claim—The combination of the lever, springs, and the detents formed on the former, arranged in the relation to the escapement wheel described, with the pallets and said escapement wheel, so as to enable the balance wheel to perform its oscillations without pressure from the motive power of the clock, or to be retarded by any other resistance except that necessary to be overcome by the vibrations of the detent lever, during the action of the pallet on the end of the spring, as set forth.

96. Machines for Dressing Stone; Wm. Cooper, Mount Gilead, Ohio.

Claim—The arrangement of the picks, screw, springs, and shaft, with the adjustable carriage, ratchet wheels, and ratchet, the same being constructed in the manner specified.

97. Cultivators; C. H. and S. E. Carrington, Weymouth, Ohio.

Claim—The arrangement and combination of the side wings and bars with each other, and in relation to the frame, in the manner specified. Also, the mode of actuating and adjusting the hoes, by means of the wheels, stirrups, bar, lever, and catch plate, arranged in combination and acting upon the handles of the hoes, substantially as set forth.

98. Machine for Peeling Willow; George J. Colby, Waterbury, Vermont.

Claim—The vibrating rollers, in combination with the rollers, comb, and apron, or its equivalent.

99. Harvesters; George E. Cooper, Baltimore, Maryland.

Claim—1st, The combination of the straining bar, finger tube, and adjusting screw, with the arms upon which the cutting blade is mounted, for the purpose of keeping the cutter, which is made thin and without stock, under constant tension. 2d, Combining the lever of the shifting clutch with the lever for raising and lowering the cutting apparatus, in the manner described, so that when it is necessary to stop the motion of the cutter, the act of depressing the lever performs the three-fold duty of raising the cutter, stopping its motion, and the motion of the raking mechanism, as described—I do not claim, however, either of these levers, separately considered, nor the functions they perform.—3d, The arrangement of the raking mechanism consisting of two hands, which open as they advance over the platform on each side of the cut grain, and close as they recede, to form the cut grain into a sheaf, and deliver it at the rear of said platform, substantially as described.

100. Machine for Sweeping Streets; Amzi Crane, Newark, New Jersey.

Claim—1st, The brush or sweeping frame, being so adjusted that when the machine is in operation, the weight of the said frame is supported, as much as may be required, at its corners, upon the springs in the posts, and is free to conform to the uneven surface of the ground either as a whole or at any of its corners. 2d, The endless band or chain of brushes, when said band or chain of brushes is operated, for the purpose of depositing the sweepings in a row, by means of the grooved rollers, or their equivalents, into which the blocks of the brushes or the links of the endless chain are made to fit. 3d, The combination together of the driving wheel, the beveled wheel, with the pulley, belt, M, rollers, Z Z, and the endless band or chain of brushes. 4th, The combination of the cross-bar with the lever, D, crank, H, levers, K and L, with their appropriate connexions, and the chains for elevating or lowering the brush frame, and throwing the machine into or out of gear, substantially in the manner described.

101. Circular Sawing Shingle Machine; Jonathan Creager, Cincinnati, Ohio.

Claim—1st, The feed rest tangential to the saw at the end toward which the saw cuts, and having a motion parallel to the plane of the saw. 2d, In this connexion the feed rolls and their accessories, constructed to elevate the feed rest by power under control of the operator. 3d, The use in this connexion of the elastic fingers, as set forth.

102. Sewing Machines; Chauncey O. Crosby, New Haven, Connecticut,

Claim—1st, The combination of the cloth holder with the needle bar and thimble bar, when constructed as described. 2d, The combination of a needle bar and thimble bar with a common needle, when made to operate as described. 3d, The combination of the feeding apparatus with the needle bar, for carrying the needle, when made to operate as described. 4th, The combination of the needle bar with the hooks and endless tapes, when arranged substantially as described.

103. Grinding and Polishing Knives; James Dodge, Waterford, New York.

Claim—The method of grinding and polishing articles, and forming their surfaces upon a revolving grindstone or polishing wheel, by attaching them to a drum or cylinder, which is made to revolve in the same direction with the stone or wheel, and with velocity adjustable thereto. Further, the method of attaching and supporting upon a curved surface of the article to be ground, so as to permit it to rock thereon, thereby shaping the surface when formed either flat, concave, or convex, substantially as set forth.

104. Fastenings for Skirt Hoops; Alexander Douglas and Samuel S. Sherwood, City of New York.

Claim—The combination of the link or loop, c, with the clasp, b, having an opening in its side to receive and retain one prong of said loop, and with the hook, substantially as set forth.

105. Portable Boxes; A. Dreyspring, Montgomery, Alabama.

Claim—Constructing boxes capable of being folded and unfolded, without thereby impairing their shape or their usefulness, substantially as described.

106. Machine for Cross-Seaming Sheet Metal; Lucian Fay, Cincinnati, Ohio.

Claim—1st, In connexion with a cross-seaming tool, the gauge bar, constructed as set forth. 2d, The grooved roller, constructed as explained, and employed in connexion with a cross-seaming tool to roll up the metal as joined, and afterward discharge the roll without unwinding. 3d, The adjustable guides, in combination with a seaming tool, for the purpose of insuring accuracy of work.

107. Construction of Iron Railings; Wm. S. Fuller, Millbury, Massachusetts.

Claim—The application and arrangement of ring segments or segmental connexions and their sockets, made substantially as described, to fence palings, and a connexion rod, the same being to effect advantages in the construction of metallic fences.

108. Pen-holder; Josee Johnson, City of New York.

Claim—The thimble, a, with incision, c, when formed of one piece of metal and applied to the pen stock as a pen-holder.

109. Sewing Machines; J. E. A. Gibbs, Mill Point, Virginia.

Claim—In combination with an eye-pointed needle vibrating up and down and back and forth in a plane passing through the line of feed, the spring hook, or a hook constructed so as to yield sidewise or laterally of the path of the needle, when actuated by said needle in the manner described.

110. Sewing Machines; Wm. O. Grover, Boston, Massachusetts.

Claim—1st, Driving or speeding up a sewing machine by means of a convex elastic face on one wheel or pulley, acting in combination with and by friction upon a non-elastic concave face on another wheel or pulley, combined and acting together substantially in the manner specified. 2d, Supporting and steadying a sewing machine by the combination of a tube of india rubber, or its equivalent, with an internal pin or projection, the two being fitted and acting substantially in the manner set forth.

111. Water Wheel; Wm. H. Harbaugh, Piquia, Ohio.

Claim—1st, The peculiar arrangement of the bucket, in combination with the projecting annular float. 2d, The peculiar form of the bucket with reference to the percussion plate, all arranged in the manner set forth.

112. Self-closing Door; J. C. Harkness, Washington City, D. C.

Claim—The ball projecting through the socket in the bridle, and falling into a socket in the plate in the sill, in combination with the weight, cord, and pulleys, the whole arranged substantially in the manner set forth.

113. Tanning; B. Harrington and N. Russell, China, Maine.

Claim—The use of comptonia aspenifolia or sweet fern in room of bark, or any other tanning material now in use.

114. Centrifugal Pumps; Wm. C. Hibbard, West Roxbury, Massachusetts.

Claim—1st, In the construction of the fan-wheel, the combination of the curved guide plate with the vanes, arranged around a central open space, substantially as described, and working in connexion with the covers and casing, or such other equivalent devices as will co-operate with it upon the same principle. 2d, I do not claim the spiral passage of discharge constantly enlarging toward its exit, to receive the accumulated discharge from the fan-wheel, as that has before been used—but, in combination with the centrifugal pump, I claim the expanding outlet constructed upon the principle described, whether employed in combination with the spiral passage of discharge or applied directly to the fan-wheel. 3d, Constructing the casing of a centrifugal pump with a detached cover, in combination with the fan-wheel and fixed casing, as described.

115. Water Wheel; J. P. and D. W. Hoyt, Lumber City, Pennsylvania.

Claim—The combination of a wheel, as constructed, with the casing, as constructed, when the two are so arranged that the water will be received on the broad backs of the buckets, and be discharged by their inclined fronts between the casing and the shaft of the wheel, in the manner specified.

116. Index or Book-marker; Josee Johnson, City of New York.

Claim—The clasp, made of one piece of metal, with the angle between its points for receiving the leaf, while the clasp is applied in a vertical position, or nearly so, and opening to receive the leaf as it is pressed against its edge, and firmly grasping the leaf when applied.

117. Tool for Chamfering Soles for Boots and Shoes; Wm. Johnson, Hampstead, New Hampshire.

Claim—The tool, as constructed, with means not only of adjusting the angular position of the knife with respect to the sole rest, but the distance of the said edge at the gauge from the rest, as described.

118. Apparatus for Preserving Malt Liquors; John Keane, City of New York.

Claim—The diaphragm or bag of india rubber, or other similar flexible material, of a form to fit simply to half of the cask or other vessel, and attached all round the middle of the same, so as to operate in the manner described.

119. Truss Pads; L. B. McLain, Sr., New Lisbon, Ohio.

Claim—Constructing pads for trusses for hernia or rupture of solid blocks of half cones with plane and curved faces, as set forth.

120. Stirrups; John Loudon and H. Iverson, City of New York.

Claim—Constructing a stirrup with a joint at or near the centre of the sides, substantially as specified.

121. Box for Carriage Wheels; R. W. McClelland, Pekin, Illinois.

Claim—In combination, a hub box with an interior groove and flanch, as represented, the peculiar manner of constructing and placing upon the spindle the spindle boxes or bearings, so as to properly fit into the above described hub boxes.

122. Constructing Frames for Wire Cloth Paper-making Cylinders; J. and R. McMurray, City of N. Y.

Claim—The spiral wire or rod and longitudinal rods, connected to suitable heads provided with journals in connexion with the spiral wire, the whole being arranged as set forth.

123. Knitting Machines; J. K. and E. E. Kilbourn, Norfolk, Connecticut.

Claim—The transferring of stitches in a knitting machine from the needles on which they have been formed to other needles, by means of transferring hooks, or their equivalents, which take the stitches from the needles, move along to other needles and deliver the stitches to these other needles, operating automatically. Also, arranging transferring hooks with reference to the needles, in such manner that they may enter the stitches upon the needles by moving along the stems of the needles toward their heads. Also, directing the operation of transferring hooks, or their equivalents, for transferring stitches by means of a pattern barrel, or its equivalent, operating as set forth. Also, combining the mechanism that actuates transferring prongs with the mechanism that moves the needles of a knitting machine, in such manner that the prongs enter the stitches upon the needles at times when the latter are supported both vertically and laterally. Also, combining a nosing having V-shaped grooves with transferring prongs having corresponding grooves, the grooves of the nosing and prongs acting in concert to confine the needles and direct their heads into the stitches on the transferring prongs. Also, controlling the operation of the mechanism by means of which the relation of the thread guide to the needles is changed, so that yarn is supplied to more or less needles by means of a pattern barrel, or its equivalent. Also, varying the extent of travel of the needle carriage in proportion to the number of needles at work, by means of mechanism operating automatically. Also, varying the periods of time at which the mechanism begins to operate in proportion to the number of needles at work, by means of mechanism operating automatically. Also, combining the widening mechanism with the mechanism that actuates the needle carriage, in such manner that the period of time at which the former operates is varied in proportion to the number of needles at work. Also, combining the mechanism that actuates the pattern barrel, or its equivalent, with the mechanism that actuates the needle carriage, in such manner that the period of time at which the former is moved is varied in proportion to the number of needles at work. Also, combining the widening mechanism and the narrowing mechanism together, when both are used in the same machine, in such manner that the movement of the one to do its work is attended by a corresponding movement of the other, so that the thread guide and transferring hook, or their equivalents, are both in the proper position to operate in connexion with the selvage needle. Also, raising the sinkers out of the way of the prongs of the transferring instrument, substantially as set forth, so that the latter may move along the series of needles without obstruction from the sinkers. Also, obtaining a pause in the endwise movement of a nut moved by a screw, by causing the screw to move endwise while it is turning in the nut. Also, the arrangement of the pattern holes by a pattern barrel in a helical line, so that they may be brought in succession beneath the device upon which the pattern pins operate by a screw, or its equivalent. Also, operating the transferring instrument, substantially as set forth, in such manner that its movement is effected partly while the carriage is traveling in one direction, and partly while it is traveling in the opposite direction. Also, combining with a traveling series of needles and a rigid bar above them, stationary under supports over which the needles ride, so that their barbs may be closed by pressure against the stationary bar above them.

124. Gas Regulators; Wm. Mallerd, Bridgeport, Connecticut.

Claim—Arranging the graduating lever, 4, with the adjustable weight, 17, in combination with the reservoir, 2, and the valve, 10, in such a manner that by raising the reservoir the valve is closed and the supply of gas stopped, so that the pressure of the reservoir can be regulated by adjusting the weight, 17. And in combination with the lever and reservoir, I claim admitting the gas to the reservoir by means of a small tube, 8, which is contracted toward its upper end, so that impurities carried up by the gas are deposited outside of said tube without being able to interfere with the working parts of the gas regulator. And, further, arranging the stud, 21, in combination with the lever, 4, rod, 9, and valve, 10, in such a manner that by depressing the stud, 21, the supply of gas may be ascertained without raising the cover of the regulator.

125. Cultivators; T. M. Lee, Broad Ford, Virginia.

Claim—So combining the cylinder, R, stock, H, and block, O, with their respective teeth, with each other, and with the main frame, as that they can individually or severally be adjusted for deeper or shallower work.

126. Machine for Chamfering and Crozing Barrels; J. H. Mattison, Scriba, New York.

Claim—A crozing tool provided with two spurs, one before the other, to cut the sides of the croze or score, and a hook or grooving tool to cut the bottom of the score, when the whole is made or formed of a single piece of metal, substantially as described. Also, the use of the solid shaft and hollow shaft, in combination with the pulleys, or their equivalents, which operate them with different velocities, when used for the purpose of giving motion to the chamfering and crozing tools, or their equivalents, and for moving or carrying them (the chamfering and crozing tools) forward to perform their work in chamfering and crozing barrels, in the way and manner described.

127. Paper Clamps; Arnold Palmer, Lee, Massachusetts.

Claim—The pressure box placed over the bed and attached to the lever through the medium of the bar, lever, and adjusting rods, actuated by the nut or tube, f, the above parts being arranged to operate as shown, and with or without the spring catch.

128. Portable Water-proof Friction Match Safe; Platt Merrill, Sanilac, Michigan.

Claim—The lever, B, provided with the spring or yielding slide, C, the plate, F, having the spring, G, and guides, r r, for retaining the matches in place, and the arm, E, provided with the corrugated spring catch, p, the whole being arranged within and connected to the case, A, substantially as set forth.

129. Machines for Separating the Fibre from the Pulp in Hemp Leaves; S. S. Mills, Charleston, S. C.

Claim—1st, The toothed cylinder, H, concave, C, provided with the steam or water pipe, S, and reciprocating bar, D, provided with the clamp, E, arranged for shredding the hemp. 2d, The vibrating toothed plates, Q Q, in combination with the reciprocating clamp bar, L, and steam or water pipes, R R, for the purpose of heckling the hemp. 3d. The cylinder, H, provided with the longitudinal plates, e, and the concave, I, provided with the loaded plates or flaps, J, for the purpose of skutching the hemp or separating the pulp from the fibre. 4th, The combination of the tooth cylinder, B, concave, C, toothed plates, Q Q, clamp bars, D L, cylinder, H, and concave, I, provided respectively with the plates, e J, substantially as specified.

130. Manufacture of Sheet Iron; David A. Morris, Pittsburgh, Pennsylvania.

Claim—The manufacture of enameled anti-corrosive sheet iron by the process specified.

131. Compound Shell for Ordnance; L. B. Olmsted, Binghampton, New York.

Claim—Surrounding an explosive shell with a number of chambered segments, each charged with cartridges or other projectiles, and discharged by fuses properly connected with the inner exploding shell, the whole forming a second or outer spherical shell, arranged in the manner set forth.

132. Manufacture of Fire Bricks; J. Ostrander and J. S. Heartt, Troy, New York.

Claim—The manufacturing of fire bricks, tiles, or blocks of a composition consisting essentially of pulverized steatite or soapstone raw fire-clay (with or without kaolin), and a fire sand ground "biscuit," or both, the ingredients being mixed in the ratio specified, or in any other available proportions, as set forth.

133. Life Preserver; Hiram Palmer, Augusta, Michigan.

Claim—The arrangement of the folding frame, the metal chambers, B B, the provision chamber within said chambers, B B, the flexible air chambers, and the propeller, the whole being combined in the manner specified.

134. Mowing Machines; Fisk Russell, South Boston, Massachusetts.

Claim—Attaching the cutters to hubs or bosses which are fitted on pins in the finger bar, and provided with arms which are fitted in notches in the cutter bar, the bosses, arms, and bar, being covered by a plate, substantially as set forth.

135. Compositions used as Building Materials; N. C. Raymond, Austin, Texas.

Claim—The application of pasture-fed cow dung, either in substance or solution, together with lime, either slacked or unslacked, or other powerful alkaline substance, and charcoal, to the common clays or soils of the country, for the purpose of producing a building material, substantially as described.

136. Horse Shoe Machine; T. H. Russell, Northfield, and Amos Morrill, Strafford, Vermont.

Claim—The movable former and lateral forming rollers, arranged with the guide rollers and grooves, the vertical pressure roller and the female die, when combined as set forth. Further, the particular arrangement of the roller bar, G, to wit: having said bar provided with the rollers, i′ i′, which bear against blocks, j j, attached to the uprights, H H, and having the pin, h, pass through an oblong slot, g, in the upper part of the bar, substantially as set forth.

137. Construction of Cylinders and Pistons for Pumps and Steam Engines; Wallace Wells, City of N. Y.

Claim—The improved mode described of constructing the cylinders, pistons, and their connexions, for steam engines, and applying steam thereto, and of constructing the cylinders, pistons, and their connexions, in fire engines, pumps, and other machines using cylinders and pistons.

138. Method of Lighting Street Lamps by Electricity; Charles W. Smith, Evans, New York.

Claim—1st, The combination and arrangement of a circuit changer with different circuits of conducting wires, in which are included a number of street lamps, in such a manner that the lamps in one circuit only may be lighted simultaneously by means of the battery current. 2d, The combination of conducting wires with devices for operating by electricity such a circuit changer at a station remote from the operator. 3d, The arrangement of the magnet, the brass plate, the lever, and the pawl, substantially as described.

139. Rotary Planing Cutter; John Sperry, City of New York.

Claim—1st, A plane formed of a series of thin plates, said plates being in form of a cima-reversa, or other form approximating thereto, and placed side by side one another on a revolving axis or shaft, and confined in place by means of a screw nut. 2d, Having the central portion of the several sections of the plane at back and front, run at right angles to the axis of the plane, substantially as set forth.

140. Mode of Reversing the Chisel in Mortising Machines; Frederick Stamm, Lancaster, Pennsylvania.

Claim—The arrangement and combination of the devices, substantially as described, for the purpose of reversing the chisel whilst in operation.

141. Rule for Describing Polygonal Forms; Merriwether J. Thompson, St. Joseph, Missouri.

Claim—The construction, use, and application of a mitre bevel gauge formed with an arc of a circle, whereon are described various given tabular numbers, so as to indicate by fixed lines, angles, or dots, any required mitre line indicating its respective polygonal shape and measurement (without describing and subdividing a circumference), but through means of corresponding tabular numbers, substantially in the manner set forth.

142. Farm Gate; Joseph A. Treat, Talmadge, Ohio.

Claim—The levers, G H, in combination with the lever, E, and link, e, said parts being applied to the gate, arranged and connected by the chains, substantially as described.

143. Manufacture of Sugar; J. C. Tucker and L. Lunzweert, San Francisco, California.

Claim—The process of decolorizing and defecating saccharine liquid and vegetable juices, and application in the manner described of hydrated alumina—cream of alumina—prepared as set forth.

144. Cultivators; W. Tucker, Blackstone, Massachusetts.

Claim—The combination of the rotary toothed drum, of rotary series of teeth, with a set of stationary gird bars and teeth projecting therefrom, the whole being arranged, applied to a frame, and constituting a new or improved cultivator or agricultural implement, to operate substantially in the manner specified.

145. Steam Generator; Ferdinand C. Warlick, Kentish Town, England; patented in England, March 9th, 1858.

Claim—The arrangement of the water heating coil of pipes, within flues leading from the fire-place, and through or about the steam generator, when such water heating pipes terminate in foraminous pipes extending into the steam generator, so as to discharge the heated water into it in fine jets, or spray, or mist, as described. And, in combination with the coil containing the flue within the generator, and the flues about the ends, and cylindrical outer surface of the generator, I claim the flue space directly beneath the coil flue, and arranged within the generator, as described. Also, the arrangement of the side flues, the two bottom flues, and single top flue of the generator, in combination with the arrangement of the water heating pipes extending through the same, and with the coil flue and fire-place, as represented.

146. Seeding Machines; Andrew Simmons, Nora, Illinois.

Claim—Forming the seed slide of a corrugated plate, and making the seed openings therein at the edges and on opposite sides of the ridges or corrugations, substantially as set forth.

147. Elastic Stair Pad; Thomas J. Mayall, Roxbury, Assignor to self and Benj. F. Cooke, Boston, Mass.

Claim—The above described "Elastic Stair Pad," of the composition and form substantially as set forth.

148. Water Wheel and Chute; Alden Whitman, Auburn, Maine.

Claim—The peculiar form of the bucket in conjunction with the corresponding form and relative position of the spout thereto, in the manner described.

149. Harvesters: John Woody, Mount Vernon, Indiana.

Claim—1st, Placing the reel between arms which have their back ends pivoted to the machine, and their front ends connected with the eccentrics on the shaft, by means of the yokes, as set forth. 2d, The roller attached to the upper part of the wing or divider, as set forth.

150. Looms for Weaving Hair Cloth; Samuel B. Chaffee (for self and as administrator of Samuel M. Chaffee, deceased), Providence, Rhode Island.

Claim—1st, Forming the selvage of hair cloth by means of a set of headles operating independently of the headles used in forming the rest of the cloth, as described. 2d, The method described of operating the jack staff by the combination of the cams, I I′, rods, K K′, lever, M, and rod, N, as specified.

151. Rack for Holding Comb Match Cards; E. G. Byam, Boston, Mass., and B. E. Parkhurst, Brunswick, Maine, Assignors to Ezekiel Byam, Charlestown, and S. A. Carlton and E. G. Byam, Boston, Mass.

Claim—The arrangement and combination of the frame, bars, spring, and screws, as described.

152. Cotton Gins; Lewis S. Chichester, Assignor to Henry G. Evans, City of New York.

Claim—The saws, in combination with the oscillating breast, the parts being constructed as set forth.

153. Cans for Preserving Paints; Edward Clark, Assignor to Wm H. Dolson, City of New York.

Claim—Attaching and securing the heads to the sheet metal body of the can or keg, by forming a projection round the interior near each end of such body, in the manner described, for the heads to rest against, and turning the edges of the body over the heads after the insertion of the latter, substantially as set forth.

154. Coating Metal; Selah Hiler, Haverstraw, New York, Assignor to John M. and Cornelius A. Berrian, City of New York.

Claim—The coating iron or steel with copper, silver, or brass alloys, where silver or copper is used, by bringing the iron or steel, while in a melted state, into contact with the coating metal, and allowing them to so remain until the two metals have become hard by cooling, substantially as specified.

155. Spelling Block; Samuel L. Hill, Assignor to Albert Palmer and Sidney Doane, City of New York.

Claim—1st, The arrangement of letters on any number of six-sided blocks, in the manner described. 2d, Giving to and placing upon each block its proper numerical figure, for the purpose specified.

156. Corn Eradicators; Corydon Wheat, Geneva, New York.

Claim—The corn eradicator, constructed as described, as an article of manufacture.

157. Harvesters; John K. Harris, Allensville, Indiana.

Claim—The rocking pinion with cogs, p and p′, adapted to yield, as explained, when passing the ends of the wheel cogs, or on the backward motion of the drive wheel.

158. Sewing Machines; Warren Millar, Assignor to self and John Nutt, Chicago, Illinois.

Claim—1st, The revolving hooked ring, constructed as described, when arranged and operating in combination with the needle and the reciprocating spool, carrying the locking thread, for the purpose specified. 2d, The loose ring applied within the rotating two hooked ring, and operating in combination therewith, substantially as described, to produce a tension on the locking thread.

159. Pumps; Henry W. Regan, Cressona, Assignor to self and George H. Newer, Harrisburg, Pennsylvania.

Claim—Combining with the water ways of a double-acting pump and air chambers divided by a partition, so that each of the water ways shall have its own air chamber, but the water from each to be transmitted into a common chamber before its exit from the pump, substantiailly as set forth.

160. Breech Loading Fire Arm; John P. Schenkl, Worcester, Assignor to self and Edward A. Dana, Boston, Massachusetts.

Claim—In combination with the bore or chamber of a fire arm or piece of ordnance, a secondary and smaller fire arm or barrel arranged within it, substantially as described. I do not claim a conical tige, as used in the "carabine a tige," and for the purpose of spreading a ball. But I claim the conical or tapering spreader or end of the tige, in connexion or combination with the chamber within the tige, and to operate in the manner as specified. Also, the improvement of the chambered tige or secondary barrel, as made with a cutting front end, and particularly as made with a serrated end. Also, the arrangement of the touch-hole of the hollow tige in the breech screw thereof, in such manner that when the breech screw is in place in the main barrel, not only shall its touch-hole communicate with that of the main barrel, but the breech screw shall intercept all communication of the touch-hole of the main barrel with the bore or chamber of such main barrel, except through the touch-hole and bore of the secondary barrel. Also, the improved combination of tige that is with the base of the spreader, made of greater diameter than the neck or part of the tige which is immediately below it, the same being for the purpose as set forth.

161. Spading Machines; Judd Stevens, Assignor to self and John L. Beadle, Marengo, New York.

Claim—Jointing or hanging the spade to the wheel, in such a manner that in the forward motion of the machine, it will remain in proximity with the periphery of the wheel until the lifting of the earth commences, when it shall pass outwards or slide upon its bearing, thereby acting more efficiently to raise and disintegrate the soil. Also, the combination and arrangement of the tripping lever with the spade, substantially as described.

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162. Extraction of Volatile Oils, &c., from Coal; Luther Atwood, Brooklyn, New York.

Claim—1st, The gradual and progressive formation at a comparatively low temperature of oleaginous vapors and oil from coal, or other substances yielding pyrogenic oils, by the gradual and progressive action of the heat of products of combustion upon and through the mass. 2d, The immediate removal of the oleaginous vapors and volatile products of decomposition from the point of formation away from further action of the heat conducing to, and resulting from, their production, through the remainder of the mass and apparatus, by means of a properly regulated current of products of combustion. 3d, Condensing the liquid volatile products of distillation within the body of the distilling tower, and during the continuous distillation of the solid materials, substantially as described. 4th, Obtaining crude oil from coal, and other solid substances yielding pyrogenic oils, by the combined and successive operation of the above mentioned methods of treatment.

163. SKELETON SKIRTS; E. G. Atwood, Derby, Connecticut.

Claim—A skirt formed of tape, or other similar material, and a series of circle hoops, when the tape is passed over one hoop and under the next below it, in opposing oblique directions, and the tapes fastened at the points where they interlock on the hoops themselves, by clasping, sewing, or tying, substantially as set forth.

164. SEEDING MACHINES; A. G. Babcock, Galesburgh, Illinois.

Claim—The described arrangement of the form rollers, grooved cylinder, elastic wipers, hopper, guide plate, drags, and windlass, when constructed as set forth.

165. COFFEE POTS; Nelson Barlow, City of New York.

Claim—The tubular condensing vessel in its specified arrangement, when cold water is used in the same, and the discharge is graduated in the manner described.

166. GAUGE FOR CONTENTS OF CASKS, &c.; John K. Barney, Warren, Rhode Island.

Claim—The double rods with arms, tubes, and index, as described, and their combination in the instrument, by which the cask is measured in length and diameter outside or inside, in manner set forth, and the construction of the tables with slides, by which is found by inspection the mean diameter, the proper allowance for thickness of staves or head, and the quantity of contents of the cask, from the given or ascertained admeasurement.

167. COMPOSITION FOR PAINTS; James K. Beardsley, City of New York.

Claim—The composition of matter to be used alone as a white paint, or in admixture with pigments for colored paints, as set forth.

168. MODE OF OPENING AND CLOSING FARM GATES; Wm. T. Boggs, Cincinnati, Ohio.

Claim—The grooved cylinder or cam actuated by the loaded pawl arm, and used in connexion with the lever and arm. Also, in combination with the cylinder or cam, pawl arm, lever, and arm, the drop latch, arranged with the levers, k, l, so that the latch may be operated automatically, as described.

169. MANUFACTURE OF WROUGHT NAILS; Otis Breden, St. Louis, Missouri.

Claim—1st, The die faces, constructed and fitted as described, operated in connexion with the slides, the crank, and the cams. 2d, The use of the bar for moving out the arm and the spring, for forcing in the chisel which is attached to the arm, to cut off the nail. 3d, The attachment of the rod to the crank working the feed gearing, causing the rollers to revolve and feed the iron from the furnace into the die faces. 4th, The employment of the header wheel and the operation of the rods attached to the crank, for moving the same around in order to bring the nail opposite the header die. 5th, The employment of the header die with the slide, for the purpose of forming the head, together with the pawl for holding up the slide, and the motion of the cam in lifting the trigger of the pawl, leaving the slide free to be forced in to head the nail by the spring.

170. POSTS FOF CLOTHES LINES; Benjamin Chesnut, Philadelphia, Pennsylvania.

Claim—The post with its row of inclined teeth, and its roller and pawl, and the brackets with their rollers, when the several parts are combined as set forth.

171. ARRANGEMENT OF MEANS FOR MAKING TIGHT JOINTS AROUND THE FAUCETS OF WATER COOLERS; John S. Clark, Philadelphia, Pennsylvania.

Claim—The projection, ring, and cap, as an arrangement of means for allowing of the making of a perfect joint, as described.

172. CUT-OFF VALVES FOR STEAM ENGINES; Benjamin Bunce, City of New York.

Claim—Combining with a slide valve of ordinary character, a cut-off valve, constructed substantially as described, that is to say, the slotted tube, secured in a fixed position upon the slide, said tube having its ends so closed that the steam shall pass to the valve through the slots, and having also upon it a cylinder slotted in like manner capable of being revolved thereon, so that the opening and closing of the slotted passages shall be effected by the action of the slide valve itself in carrying the cut-off to and from the stops set to intercept the revolving cylinder, as set forth.

173. LIQUID GAUGE; Erastus T. Bussell and Joseph Smith, Cincinnati, Ohio.

Claim—The double spring valve composed of valves, springs, and rod, or their equivalents, combined with a measuring faucet, as described.

174. CARPET SWEEPER; Augustus C. Carey, Ipswich, Massachusetts.

Claim—1st, Placing the revolving brush at the extreme front of the box, and hanging it in adjustable bearings. 2d, The deflector, operating substantially as described. 3d, The combination of the revolving brush, the double pulley, or its equivalent, and the roll, when so arranged that the brush may be disconnected from the roll and be operated by hand, substantially in the manner specified.

175. LUBRICATOR; Elias Clampitt, Baltimore, Maryland.

Claim—The peculiar construction of my valve and the introduction of hollow tube into stem (in connexion with valve), with its openings and flanch below, acting as a valve against the lower end of shaft, supplied with a spiral spring at top, producing thereby a self-acting valve, when the pressure on cup is removed, as described.

176. MANUFACTURE OF SHEET IRON; Josephus Chandler, Attica, Ohio.

Claim—Coating or covering bars, plates, or sheets of iron, or either of them, before, at, or during the manufacturing process of heating and rolling with clay, iron ore, or other mineral matter, salts, and also with the chlorides or other compounds of zinc, tin, &c., or of their mixtures with other mineral matter, for the purpose substantially as set forth.

177. HAMMERS; Josiah P. Clark, Portland, Maine.

Claim—The combination with an ordinary hammer of the metallic plate with an opening and slide, constructed substantially as set forth.

178. HORSE COLLARS; C. K. Cuckler, Columbus, Ohio.

Claim—The combination of the breast plate, E, springs, D D, side plates, a a, and springs, c c, when the whole are arranged in the manner specified.

179. MACHINES FOR LIFTING HEAVY WEIGHTS; T. J. Davis, Scroepell, and J. B Warner, Volney, New York.

Claim—The combination of lever, D, operating horizontally, and lever, C, moving parallel to each other

in a line with the fulcrum, and catching alternately into ratchet, N, as they are made to reciprocate by the vibrations of lever, D, as described.

180. HAMMER HEADS; Rufus Dawes, Washington City, D. C.

Claim—A hammer head, with its face inclined to the longitudinal axis of the head, in the manner set forth.

181. PLOUGHS; John Dickson, New Castle, Pennsylvania.

Claim—The use of a double movable landside for increasing the size and weight of the plough, in the manner described.

182. MARINE PROPELLER; John Eaton, Belleville, Canada.

Claim—Propelling boats by means of paddles or vanes rotating in, and surrounded by, a casting provided with an aperture or apertures near the centre to receive the water, and with a radial spout for the discharge, when such rotating vanes or paddles and surrounding case are placed at the stern, and outside the boat or vessel, substantially as described. Also, making said case which surrounds the paddles or vanes so that it can be turned to place the discharge spout in any desired direction relatively to the plane of the keel, for the purpose of propelling the boat or vessel either forward or backward without reversing the direction of the propeller, and also for steering or turning, as set forth.

183. PADDLE WHEEL; H. Ehrhart, Muscatine, Iowa.

Claim—The described system of lever-like arms, carrying the floats pivoted to the body of the wheel, and combined with each other by the floats and rods, and operating substantially as described, in combination with the guides.

184. HARVESTERS; Rosewell H. Fisher, Claremont, New Hampshire.

Claim—1st, The combination of the connecting rod, e, slide bar, c, eccentric wheel, d, rod, f, and lever, g, with the cutter, k, for the purpose of throwing said cutter bar in and out of gear. 2d, The arrangement of the plates, h, the cutters, i i i, the slotted wheels, n n n, and the cutter bar, k, with the fingers, j j, the same being conjoined and constructed in the manner described. 3d, Securing the reel, H, to the wheels, J J, when it is operated and adjusted by the means set forth.

185. FURNACES FOR TEMPERING STEEL; Perry G. Gardiner, City of New York.

Claim—1st. The heating of steel for the purposes of preparation, for hardening, tempering, or annealing in a closed chamber or oven of fire-brick, or other suitable material, impervious to the flame, smoke, and gases of combustion—the smoke, flame, and gases of combustion being distributed over the exterior surface of the floor, roof, and rear of the heating oven, by means of vertical and return or reverberatory flues between the fire chamber and chimney. 2d, The perforated air tube placed at the foot of the vertical descending flues on the side of the bridge wall opposite the fire-place, in combination with the fire chamber and flues, and between the fire chamber and oven, operating in the manner set forth.

186. PHOTOGRAPHIC SHIELD; Ebenezer Gordon, City of New York.

Claim—The corners formed with two recesses, and applied at the angles of a square frame to receive the photographic plate, or its equivalent, in a horizontal or vertical position, as set forth.

187. WRITING TABLE; Jacob S. Haskill, Salem, Massachusetts.

Claim—The arrangement of the circular bolt with, and for fastening of the several drawers, substantially as specified.

188. STAVE JOINTER; William Halderman, Freeport, Illinois.

Claim—The combination of the rotating conical cutter heads and the polygonal feed wheel, arranged for joint action substantially as set forth.

189. APPARATUS FOR MAKING GLASS STOPPERS FOR BOTTLES, &c.; Thomas R. Martell, Philadelphia, Penna.

Claim—The block or die with its vertical recesses, in combination with the spindle, its grooved disk, and the radial punches, when the whole are arranged substantially as set forth.

190. SEWING MACHINES; George W. Hubbard, West Meriden, Connecticut.

Claim—Operating the looper by means of a pin working in conjunction with the needle, in the manner substantially as described.

191. CONSTRUCTION OF METALLIC SIDE PAVEMENTS; Peter H. Jackson, City of New York.

Claim—The combination of the tie rods and brackets formed on the under sides of the plates, with the staunchions acting to connect said plates to each other, straighten said plates, and strain the said tie rods, substantially as specified.

192. BOTTLES FOR CONTAINING MERCURY; Isaac G. Johnson, Spuyten Duyvil, New York.

Claim—The mercury bottle formed and composed of malleable cast iron, substantially in the manner set forth.

193. WATER GAUGES FOR STEAM BOILERS; J. Johnson and R. Lapham, City of New York.

Claim—The hollow plugs with conical stem fitting into the glass tube, and the elongated hole or passage, in combination with the screw for adjusting the plugs, operating as described.

194. HOISTING JACKS; William Kearney, Newark, New Jersey.

Claim—The combination of the screw shaft, two or more concave faced worm wheels, two or more worms of different threads, the journals of the worms in eccentrics, two nut cases or boxes with an adjustable crank, in the manner specified.

195. RE-SAWING MACHINE; William D. Leavitt, Cincinnati, Ohio.

Claim—The combination of the yoked feed rollers and clamps extending up to or near the perimeter of the saw, for the purpose of feeding through and pressing out all the warps or bends in the board or plank, and holding them so pressed out until the same acts substantially as described. Also, the combination with the yoked feed rolls and clamps, operating together as described, the auxiliary feed rolls to receive and feed in the next succeeding board or plank without affecting the action of the other rolls on the plank or board being sawed.

196. HOOP SKIRTS; George Mallory, Watertown, Connecticut.

Claim—The construction of one or more of the hoops or springs of a skirt, with elastic pieces, or their equivalents, arranged one on each side so as to provide for flexure of said hoop or hoops over the edge of a

seat, when its or their back parts are sat upon, without impairing their flexibility, in an upward and downward direction of any other parts than those where the flexure is immediately required, substantially as described.

197. Maize Harvesters; C. B. Matthews, Oquawka, Illinois.

Claim—The saw and stationary cutters, in combination with the revolving arms attached to shafts, when the several parts are arranged to operate as set forth. Also, in combination with the above, the sliding bars or slats connected with the lever, and arranged with the opening in the platform, as described.

198. Bedstead; Rufus Maxwell, Tucker County, Virginia.

Claim—The construction and arrangement of the end rail with the notch, the side rail with the tenon, substantially as described.

199. Combined Mop and Brush; Henry McClay, Niles, Michigan.

Claim—The tri-lateral block or head attached at one side to the handle, and having a brush formed on one of the other sides, the remaining side being corrugated and having a cloth attached, the whole being arranged as set forth.

200. Field Fence; John B. Mitchell, Wayne, New York.

Claim—The combination of the slotted post with the panels, when constructed with the slides and auxiliary battens, so as to form a fence readily convertible from a straight to an angular one, substantially in the manner set forth.

201. Rolls for Planishing Iron; James Noble, Monongahela Borough, Pennsylvania.

Claim—The use of rolls having a straight groove, depression, or recess extending parallel to its axis for the entire length of the roll, or at least for the length of the other roll of the pair into which the other roll is placed before they are pressed together, for the purpose of securing a degree of pressure adequate to the planishing of single sheets of metal, in the manner described.

202. Coffee Roasters; C. J. C. Peterson, Davenport, Iowa.

Claim—The application of a damper, constructed and operating substantially as set forth, to the drum of a coffee roaster. Also, the spring catch and block, in connexion with the sliding door of the drum, constructed as described.

203. Ploughs; Wm. Reaney, Berzelia, Georgia.

Claim—1st, The mode of varying the form of the plough by the use of the adjustable coulters, the latter being provided with the sub-soiler, and the several parts constructed as set forth. 2d, The use of the wedge, in combination with the mould-board for adjusting the entire front part of the mould-board to correspond with the adjustment of the coulters, as described.

204. Raking Attachment to Harvesters; A. R. Reese, Phillipsburgh, New Jersey.

Claim—The combination of the vibrating arm, the rake, the link piece, and the crank, when the several parts are constructed substantially as described.

205. Clasps for Metallic or other Flexible Bands; Albert C. Richard, Newtown, Connecticut.

Claim—The use of frame, a, and ring, b, in combination with band, c, substantially as described.

206. Burglars' Alarm; H. R. Robbins, Baltimore, Maryland.

Claim—The manner specified of combining and arranging relatively to each other on a door and door frame, or other structure, the alarm movement, cap nipple, exploding spring hammer, and stop or set pin, for the purpose set forth.

207. Seeding Machines; Marshall S. Root, Medina, Ohio.

Claim—The bent arms, Q Q, arms, P and U, rod, O, and spring, R, when these several parts are arranged as described, for operating the corn planter and sower, and combined with the revolving harrow, as set forth.

208. Method of Opening and Closing Farm Gates by Approaching Vehicles; E. C. Rowland, Phelps, New York.

Claim—The connexions described of the levers and the endless chain, as connected with the gate, for the purpose of forming self-opening and shutting gates.

209. Submarine Explorer; Van Buren Ryerson, City of New York.

Claim—The method of controlling the rising and sinking power of the apparatus, by means of a reservoir or reservoirs of compressed air, connected and combined with a working chamber or chambers, and rising or sinking therewith, so that the operators within, by the use of the compressed air, can readily control the rising and sinking power of the apparatus without communication with the surface. Also, a submarine explorer, in which the rising and sinking power is controlled by a reservoir or reservoirs of compressed air, making part thereof, and rising and sinking therewith, and in which there are two or more working chambers, the dividing the said working chambers by a hatchway, which can be closed water and air-tight to sustain the apparatus with the top above water, when said top is open for any purpose, as set forth. Also, in combination with the reservoir or reservoirs of compressed air, connected and combined with one or more working chambers, and rising and sinking therewith, the employment of one or more ballast chambers at or near the bottom, and so arranged that at the will of the operators they can be made to communicate with the compressed air reservoir or reservoirs, and with the surrounding water to increase the lifting or sinking power of the apparatus, as set forth. Also, in a submarine explorer, combining with the working chamber or chambers thereof, the employment of a spray or shower of water, which at the will of the operators inside may be discharged at any time required to purify the air by absorption. Also, in combination with the reservoir or reservoirs for compressed air, combined and moving with one or more working chambers, the employment of a pump which can be worked by the operators within, and which communicates with the reservoir or reservoirs of compressed air, and also by means of a flexible pipe and float provided with a self-acting valve with the atmosphere above, so that in case of accident the operators within can replenish the air in the reservoirs to enable them to control the apparatus, as described.

210. Method of Applying Electricity during Extraction of Teeth; J. S. Simmerman, Glassborough, New Jersey.

Claim—Applying electricity to the gums or teeth, or both, during the operation of extracting teeth, by means of the insulated adjustable spring clip described, or its equivalent, the said clip being connected to one of the poles of an adjustable electro-magnetic machine, or its equivalent.

211. Harvesters; J. D. Smith, Lancaster, Ohio.

Claim—Having a horizontal joint in and near the centre of the reel frame piece, substantially as set forth.

212. Umbrellas; Henry Steele, Jersey City, New Jersey.

Claim—The combination of a lock with a closing catch of an umbrella, for the purpose specified.

213. Machine for Cutting Staves from the Bolt; Wm. Steele, Wheeling, Virginia.

Claim—1st, The use of an apron hinged to the bed plate, as described, or otherwise attached to the machine in such a manner that it can be held under or back of the knife to support the piece during the process of cutting, and then swing down or fall back to allow the piece to drop from the knife. 2d, The combination of the levers and stops, as described, or their equivalents. 3d, My improvement to be applicable to machinery for cutting steamed wood, for any or all of the purposes for which it is now (or may be) cut.

214. Cultivators; T. S. Stevens, Pepperell, Massachusetts.

Claim—The combination of a set of vertical stripping cutters and a set or series of revolving under surface cutters, applied to operate together, substantially as specified.

215. Hydrants; James Swan, Brooklyn, New York.

Claim—The use of the elastic tube, in combination with the metal or rigid tube, for the purpose of excluding water from the entire length of the hydrant, when arranged substantially as described.

216. Paper Feeder for Printing Presses; Lemuel T. Wells, Cincinnati, Ohio.

Claim—In the described connexion with the cylinder of a printing press, the vibrating frame bearing the nippers and opposing bar, and operated substantially in the manner set forth.

217. Nut Machines; S. H. Whitaker, Cincinnati, Ohio.

Claim—1st, The die-box and punch, or their equivalents, operating as set forth, so as to embody the greater portion of the wad or core in the nut or bar, while confined on all sides save one, in the act of punching. 2d, The arrangement of the punches, dies, and perforated bridge, or equivalent devices, operating together substantially in the manner described, for the automatic and economical manufacture of hot-pressed nuts.

218. Devices for Adjusting to a Right Angle the Joiner's Square; L. Yale, Jr., Philadelphia, Penna.

Claim—Extending an arm, or its equivalent, to act as a lever along the handle or stock far enough to insure the proper effect of the adjusting screws, or their equivalents, for the purpose and substantially as described.

219. Bank Locks; S. S. Burlingame, Assignor to self and Wm. Taylor, Warwick, Rhode Island.

Claim—One or more pairs of spring slides to close the key-hole, provided with pins to enter the notches and lock the collar or working key, the slides being so constructed as to be pushed open by the point and bits of the key when it is inserted as described. Also, the collar or working key, in combination with the pawls, so constructed and arranged as to be pushed out by the bits of the key, when it is inserted as described. Also, closing the key-hole and locking the working key by the sliding tube or collar, pushed out by a spring and locked in the key-hole by the bolt, as described. Also, fastening the working key to the back plate of the lock by means of a flanch and plate, substantially in the manner described.

220. Manufacturing Car Wheels of Cast Iron; G. S. Bosworth, Assignor to Anson Atwood, Troy, N. Y.

Claim—The employment of highly heated "chills," when combined with sand moulds, in the manner set forth.

221. Lathe for Cutting Screws from Wire; George W. Daniels, Assignor to self and Abraham Fuller, Waltham, Massachusetts.

Claim—Combining with a lathe arbor devices made and applied to it, substantially as described, so as to enable rods varying in diameter to be securely clamped and centered in the arbor, and to extend entirely through it, in manner as specified.

222. Chronometer Escapement; Thomas Morrison, Assignor to A. S. Solomons, City of New York.

Claim—1st, Vibrating the detent of a chronometer (or single beat) escapement by direct mechanical action. 2d, The detent lever vibrating on pivots or a staff, when operating in the manner set forth. 3d, The arrangement and operation of the pallet, in the manner specified.

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223. Tools for Manufacturing Wire Riddles; Sanford Adams, Boston, Massachusetts.

Claim—The tool for manufacturing riddles, having teeth, operating in the manner substantially as set forth.

224. Washing Machines; Wm. T. Armstrong, Sandwich, Illinois.

Claim—Making one or more inverted ribbed curves in an arched or curved rubber, substantially as described.

225. Scrubbing Machine; Samuel M. Barnett, New Orleans, Louisiana.

Claim—The tri-lateral frame provided with the soap and water boxes, arbor with brush attached, and the movable bars with brushes and sponges, either or both, or their equivalents, attached, the whole being arranged as set forth.

226. Grain-discharging Attachment to Harvesting Machines; J. F. Black, Lancaster, Illinois.

Claim—Operating the gavel discharger, that is to say, the rotating arms of shaft from the driving wheel through the medium of the wheel provided with the slot and tooth, and the pinion provided with a quadrilateral plate, as described.

227. Car Seats; A. C. Blondyn, St. Joseph, Missouri.

Claim—The combination and arrangement of the swinging frame, extending and rolling mattress, the roller, D, shaft, H, roller, H', and cord, G, or their equivalent, for operating said mattress, and the sectors to which the seat bottoms are secured, by which a seat facing either end of the car, or a reclining or sleeping couch, capable of accommodating the two occupants of the seat, can be obtained, the whole being constructed as described.

228. Churns; James H. Bump, Morris, New York.

Claim—The arrangement and combination with the churn of a chamber through which the air that mingles with the cream is made to circulate, substantially as described.

229. Extension Splints; William Bunce, Sullivan, Ohio.

Claim—The combination and arrangement of the side pieces, forming with the band and set-screws an

adjustable splint, the foot-piece with its joint, b, and set-screw, the flexing braces, the extension bar, the windlass and cord, the perineal pad and pads, all combined and arranged as described, so as to form an extension splint, operating in the manner substantially as set forth.

230. Steam Pumping Engine; Ezra Cope, Cincinnati, Ohio.

Claim—The arrangement of steam and water passages, both in one trunnion, and guide rods, to complete an independent pumping engine. Further, arranging the escape steam passage, to separate the steam supply and water passages, to prevent condensation of the supply steam, all substantially as set forth.

231. Washing Machine; Theodore G. Eiswald, Providence, Rhode Island.

Claim—The washing of clothes by means of the arrangement, construction, and combination of the two cylinders revolving in different directions, substantially as described.

232. Cider Mills; John Eiberweiser, Cincinnati, Ohio.

Claim—The particular construction and arrangement of two cylinders, as described.

233. Brick Machines; Thomas Forbes, Kansas City, Missouri.

Claim—The arrangement and combination of the variable rods with the sockets, pinions, and spur wheel, as described.

234. Grain Separators; Aaron Foster, Quincy, Illinois.

Claim—The arrangement of the annular receptacles, in combination with the trumpet-shaped cone, and also the employment of the interior of said cone as an additional receptacle together, for the purpose of assorting the mixed grains, after separation from the wheat, according to their respective qualities, substantially as described.

235. Bedstead Bottom; Samuel E. Hartwell, City of New York.

Claim—The adjustable rack, carrying the elastic loop and connected to the slat by the clasp, substantially as specified.

236. Self-mousing Hook; John R. Henshaw, Middletown, Connecticut.

Claim—A self-mousing hook having a socket and ear, and a horizontal spring, made as described.

237. Railroad Switches; Simeon Heywood, Claremont, New Hampshire.

Claim—The arrangement and construction of the bent or curved bars, having racks attached and operated by a pinion, as described.

[In connexion with the ordinary switch rails this inventor uses a movable frog, so arranged that the switch and frog will be operated simultaneously by the movement of a single lever or shaft, and the frog, as well as the switch, moved in line with the rails over which the train is to pass. By this improvement a continuous track is formed, thereby obviating the objections to the usual stationary frog, to wit: the danger of the cars being thrown from the track, and the wear and tear of the switches, as well as the wheels and running gear generally of the cars, in passing over the switches.]

238. Pen Fountains; Josee Johnson, City of New York.

Claim—The application to the ordinary pen of a spiral spring fountain, when constructed with an adjustable band, in the manner described.

239. Machines for Making Candles; John Jones, Baltimore, Maryland.

Claim—The feeding and packing roller with blades moving alternately in and out by the cam, as shown, or by an eccentric, or any other device, for the purpose of feeding and working tallow, wax, or other plastic material. Also, the combination of one or more feeding and packing rollers with the various moulds for the different purposes to which it is applicable. Also, the entire combination of the machinery for the purpose of cutting and removing the candles, as described.

240. Cheese Press; Hartwell Kendall, East Dorset, Vermont.

Claim—Applying the power through the sliding frame, by means of the ratchet wheel, and the pawls, lever, and crank, connected therewith, or their equivalents, so that the shaft of said ratchet wheel shall act upon and move the eccentric, at the same time serving as an anti-friction roller, whereby simplicity, lightness, and compactness of construction, and greater efficiency of action are secured, as specified.

241. Chimney Caps; Bernhard Kihlholz, St. Louis, Missouri.

Claim—The chimney smoke regulator, consisting of the pipe, deflector, and cap, enclosed in cylinder, attached to cover, the whole constructed as set forth.

242. Dining and other Tables; Alexander Kinkead, Washington Co., Ohio.

Claim—The combination and arrangement of the adjustable drawer-like or chambered rotating tablet, with the hinged upwardly folding disk, when constructed as shown, and used with a dining or other table, for the purposes substantially in the manner as set forth.

243. Gasometers; George W. Kraft, Philadelphia, Pennsylvania.

Claim—The construction and application of the V-shaped cup or lute, whether as shown by the inner section, fig. 2, or by the inner and outer section, fig. 3, and this I claim whether it be accomplished precisely as described, or in any manner equivalent thereto, producing substantially the same result.

244. Flat Iron; David Lithgow, Philadelphia, Pennsylvania.

Claim—The combination of the two jet pipes and the heating plate, in the manner substantially as described.

245. Spoke Machine; Luke L. Knight and D. H. Rice, Barre, Massachusetts.

Claim—The employment or use of two carriages, in combination with expanding cutter heads, or any proper cutting tool, arranged to operate substantially as set forth. Also, the circular saw, in combination with the expanding cutter heads, when the parts are connected so as to operate conjointly, as shown, to wit: as regards their lateral and rotating movements, and used in connexion with the carriages, for the purpose specified. Further, the loaded arms, e, attached to the swivels, d, the arms being forked at their outer ends and used in connexion with the curved bars.

246. Brick Machines; John Kutts, Philadelphia, Pennsylvania.

Claim—The main cylinder, when constructed and arranged in the manner and for the purpose specified, that is to say, with the stationary hollow axis, with the beams or truss through the same, the eccentric collar, piston, with its knuckle joint and shoe and division plates. Also, the arrangement of the double chamber or box beam over the cylinder, in combination with the back horizontal pistons and cut-off slide, propelling bars,

and levers, all arranged for joint operation in the manner set forth. Also, the compound or double levers in the box over the press beam, when these are constructed and arranged in connexion with the gearing or fly-wheel, substantially in the manner set forth. Also, the double rimmed elevating and filling boxes, when constructed as specified. Also, the pulverizers, when constructed in the manner specified. Also, the fly or wing wheel for lowering the brick from one belt to another belt, at right angles thereto, when constructed as described.

247. Bridles to Prevent Horses from Kicking or Running Away; John M. Lanier, Eufaula, Alabama.

Claim—The employment of two bits, so arranged with two sets of reins that one bit will operate upon the lower jaw, while the other operates upon the roof of the mouth and upper jaw, the same being combined and operated in the manner specified.

248. Lamp Wicks; James Y. Leslie, Brooklyn, New York.

Claim—A lamp wick composed of a single yarn when double looped, as described.

249. Paddle Wheel; Richard B. Locke, Stapleton, New York.

Claim—Connecting the plates to each other or to staying rings at their adjacent angles, substantially as described.

250. Hydro-carbon Vapor Burners; Alonzo M. Mace, Springfield, Massachusetts.

Claim—The use of a heating chamber, connected with vaporizing tubes at the crown or upper part and over the flame, constructed substantially in the manner set forth.

251. Cotton Presses; Cornelius Martratt, Waterford, New York.

Claim—The application of the racks connected to the frame, in combination with the pinions and side shafts revolving freely, and connected to the sides of said follower, for the purpose of distributing the pressure equally over the surface of follower as it is raised, and obviating the tipping and end strain, and diminishing the friction, substantially as set forth.

252. Transit Instrument; Robert C. Matthewson, San Francisco, California.

Claim—The manner in which the instrument is constructed, so as to ascertain the longitude, and run a true parallel of latitude by fore and back sights.

253. Ornamental Glass; Jasper S. Miles, Ann Arbor, Michigan.

Claim—The said manufacture produced by the combination of two plates of glass with coloring matters, by a process like that specified.

[The colors, which may be zinc white, vermillion, Paris green, ultramarine blue, or others, are ground very fine, and mixed with boiled linseed oil and Damar varnish. These are then laid on two pieces of glass with a dubber or brush, and one piece of glass placed on the other, with their painted surfaces in contact. They are then worked upon one another slightly with the hand, separated, and left to dry—they are again placed in contact, and secured together, and when seen with the light shining on them, have a highly ornamental appearance. When viewed placed between the observer and the light, the coralline or foliated appearance is distinctly visible.]

254. Refrigerator; James Naughten, Cincinnati, Ohio.

Claim—The combination of the valves and rods, arranged substantially as set forth.

255. Device for Elevating Water by the Combustion of a Volatilizable Hydro-carbon; Robert Nelson, City of New York.

Claim—Elevating water by producing a vacuum with a proper receiver, by means of any hydro-carbon fluid, when so applied and arranged with suitable mechanism that the fluid will be volatilized in proper or desired quantities, and exploded by one and the same source of heat. Further, the particular means employed for volatilizing and exploding the hydro-carbon fluid, to wit: the box, M, provided with a lamp and valve, and attached to the box, G, into which the tube, J, being provided with a cock, which, as well as the valve, is operated by the movement of a slide, substantially as described.

256. Rails for Street Railroads; Samuel Nicolson, Boston, Massachusetts.

I do not claim making the railroad car wheel bearing surface of the rail with a flat or slightly curved top, having its corners rounded down to quadrantal arcs, such being the common way of forming the said rail. But I

Claim—Making the rail with the straight or slightly curved inclined surface or plane, a c, arranged with respect to the surface of the street, as shown. Also, as an improvement in the guard, making it a flat plane, arranged as shown. Also, making the inside corner of the rail angular, with reference to the upper surface of the horse tread, as shown.

257. Cooking Stoves; John Pearson, Jr., Newburyport, Massachusetts.

Claim—The combination and arrangement of the hollow back of the fire-place with the oven, the fire-place, and the flue, whereby the heat of the fire-place and the said flue is made to warm the air which passes into the hollow back, such air being subsequently discharged into the oven, as described. Also, the combination and arrangement of the smoke flues and the air flues, the whole being disposed with respect to the oven, essentially as described. Also, the air guard as arranged on the upper smoke flue, and with respect to the air register and discharge pipe thereof, substantially in manner as specified.

258. Railroad Car Coupling; Philander Perry, Troy, New York.

Claim—The combination of the horizontally and vertically moving links, with the parts which adjust said links perpendicularly, so as to suit different heights of platforms, and with the vertical lever and horizontal rod for moving the links apart horizontally, so as to disconnect the cars, and with the sliding spring boxes which allow the cars to approximate without straining the pins when the cars crowd upon one another, substantially as set forth.

259. Copying Press; Edwin and Jacob B. Platt, Clarke Co., Georgia.

Claim—The stirrup and its plates, arranged substantially as set forth. Also, the frame, in combination with its levers, so arranged with the bed plate and follower as that they can be easily separated from each other, and then packed to form a portable copying press.

260. Washing Machine; Joseph F. Pond, Cleveland Ohio.

Claim—The suspension of the rollers upon the vibrating bars at the extremities of slide rods, in combination with the spring and upper roller, the whole constructed as set forth.

261. Mode of Operating Pumps; Daniel J. Rogers, Magnolia, North Carolina.

Claim—The arrangement of the intermediate auxiliary lever, flexible frame, pistons, elevated rocking shaft, elevated weighted rod, and pendulous handle or lever, in the relation to each other shown.

262. Method of Insulating and Supporting Lightning Rods; Elkanah C. Rogers, Boston, Massachusetts.

Claim—Making the insulator cap with the adjustable or turning loop, a, applied to it, and arranged so as to operate substantially as described. Also, combining with the rod or conductor and adjustable rest, applied to it and the insulator cap, substantially in the manner specified. Also, combining with or arranging in the cap of the insulator, and with respect to the insulating material, an annulus or ring, applied substantially in the manner set forth.

263. Tiller Rope Protector; John Sample, Meadville, Mississippi.

Claim—Placing a double casing of metal, made in sections so as to reach their interior, and with air space between them, around, over, or under the tiller ropes of vessels, to protect them from the accidents of fire.

264. Connexion of Steam Engines with Propellers of Steam Vessels; Ross and Thomas Winans, Baltimore, Maryland.

Claim—The combination of two engines or sets of engines with an intermediate vertical transverse propelling wheel, to the shaft of which the engines are directly connected, substantially as set forth.

265. Steam Engines; C. A. Schultz, City of New York.

Claim—The revolving cam wheel, with the opening cams and adjustable cut-off cams, constructed as described. Also, the socket, with guide rods.

266. Machine for Mining Coal; Elisha Simkins, Allegheny, Pennsylvania.

Claim—1st, The arrangement of the double or compound slide and sliding frame, when used in connexion with the stationary frame, and operated by the screws and the nut, as described. 2d, The arrangement of the cam, slide rack, wheel, shaft, shifting piece, levers, ratchet wheels, and the ratchet pawls, for the purpose of moving the upper end of shaft back and forward, and for operating the screws, as described. 3d, The arrangement of lever and the connecting rod, for the purpose of regulating the angle of the picks, as described. 4th, The arrangement of the flexible connecting rod, the crank, the shaft, the arms, the pick receivers, and the picks, as described.

267. Washing Machine; H. E. Smith, Philadelphia, Pennsylvania.

Claim—The vessel, with its yielding valved diaphragm and the perforated diaphragm, or its equivalent, in combination with a pipe communicating with the vessel at a point above, and the pipe at a point below, the said diaphragms, and both pipes communicating with any suitable heating apparatus, substantially as set forth.

268. Machine for Drawing Bolts; C. L. Stevenson, Charlestown, Massachusetts.

Claim—A machine for drawing bolts from timber, consisting essentially of the rotating toothed wheel, which is forced up to the bolt by pressure applied through the roll, or its equivalent.

269. Applying Power to Cranks of Engines; Thomas Stewart, Philadelphia, Pennsylvania.

Claim—Keeping the piston rod at rest, whilst the crank makes about one-fourth of its revolution on each opposite side of an imaginary line passing across the centre of said crank's shaft, at right angles with another, such line passing through the axis of the piston rod, the same being effected by means of the yoke, or its equivalent, constructed so as to operate upon the crank, substantially in the manner described.

270. Bee Hives; Peter Taltavull, Washington City, D. C.

Claim—The arrangement of a simple rectangular containing box, suspended diagonally, in combination with honey boxes therein arranged similarly, all having outlets or passages downwards from their extreme lower edges, whereby the entire hive is rendered self-clearing, and a sloping roof by the same arrangement is produced, substantially as specified.

271. Machinery for Pearling, Polishing, and Finishing Rice; R. P. Walker, City of New York.

Claim—The revolving cylinder, coated with emery and carrying the sectional rubbers of gum elastic, or equivalent material, in combination with the hollow cylinder revolving in the opposite direction to the cylinder, for the purpose of pearling and polishing rice or grains in substantially the manner specified. Also, the cylinder, constructed with alternate screens and emery surfaces, to act in connexion with the interior revolving cylinder, d, to remove and pass away the douse and chits.

272. Apparatus for Generating Gas; A. B. Wilson, Waterbury, Connecticut.

Claim—1st, The combination of a still with passages leading therefrom downward to a pipe, and so combined therewith as to protect the still from heat, the two being constructed as specified. 2d, In combination, a gas still, converting passages, and a valve, all combined substantially in the manner set forth.

273. Apparatus for Cooling Warts; John Wilkins, Troy, New York.

Claim—1st, The cooling apparatus, as described, with the thin metallic operating plate placed horizontally and fastened so as to be easily removed for the purpose of cleaning, together with the specific arrangement of ribs and joists, or their equivalents. 2d, The distributing and collecting troughs with their respective ice water and waste water troughs, at the ends of the operating plate. 3d, The combination of the said parts, namely, the operating plate with its joists, ribs, and modes of fastening troughs at each end, and regulating valve, or of parts substantially the same, when they are employed as a cooling apparatus, in the manner set forth.

274. Window Stop; Turner Williams, Providence, Rhode Island.

Claim—The roller, shank, spring, lever, or their equivalents, in combination with the inclined surfaces, and operating in the manner substantially as set forth.

275. Hulls of Steam Vessels; Ross and Thomas Winans, Baltimore, Maryland.

Claim—Constructing the hull in the form of a spindle, substantially as described.

276. Steam Vessels; Ross and Thomas Winans, Baltimore, Maryland.

Claim—1st, The combination of a spindle-shaped hull, formed of two separate water-tight vessels, united by a sleeve or framing, with a propeller, arranged and operating substantially as set forth. 2d, The sleeve, in combination with the ribs or standards, for connecting the two end portions of the spindle-shaped hull, steadying the vessel as a keel does, and directing the course of the water as it enters and leaves the space occupied by the propeller. 3d, The combination of the two end portions of the spindle-shaped hull, with the towers and the bridge between them, for the purpose of affording ingress to, and egress from, each end of the hull,

and a means of communication between them, and also supplying a suitable means of ventilation of the two parts of the hull, substantially as set forth.

277. CONSTRUCTION OF OCEAN STEAMERS; Ross and Thomas Winans, Baltimore, Maryland.

We are aware that it has been proposed to use an annular propeller revolving around a vessel, but such a form, from the great amount of friction produced, and its liability to distortion, owing to its want of strength, could not be employed with success; besides, our invention is easily distinguished from such a contrivance, as this refers only to a propelling wheel, which has a continuous radial support from the axis of rotation. All such arrangements are therefore essentially different from ours, and we

Claim—The combination of a vertical transverse trunk within the hull of a vessel, with a screw propeller of large diameter whose blades shall project beyond the outline of the hull, substantially as set forth.

278. PREPARATION OF ALUMINUM; Luige Ferrari Corbelli, Florence, Tuscany, and Vincent Paitti, of the Duchy of Modena, Assignors to L. Ferrari Corbelli, aforesaid.

Claim—1st, The combination of operations set forth, whereby we are enabled to reduce aluminum from earthy matters containing it as a base, or in combination with other matters 2d, The application of the prussiate of potash to the clay or earthy matters, and the treatment of such clay or earthy matters with prussiate of potash in the presence of heat, substantially as described.

279. ARITHMETICAL PROOF RULE; S. S. Young, Eaton, Ohio,

Claim—The described instrument for proving the result of arithmetical calculations, when constructed and operated substantially in the manner set forth.

280. MANUFACTURE OF ALUMINUM AND CALOMEL; Luige Ferrari Corbelli, Florence, Tuscany, and Vincent Paitti, of the Duchy of Modena, Assignors to Luige Ferrari Corbelli, aforesaid.

Claim—The process described of manufacturing at the same time aluminum and protochloride of mercury, by means of galvanic precipitation, as set forth.

281. PATCHING BALLS FOR BREECH-LOADING RIFLES; L. H. Gibbs, Assignor to the Gibbs' Arms Company, City of New York.

Claim—The method of patching a rifle ball, substantially as set forth.

282. HINGES; R. Hart, Washington Co., Assignor to T. F. Hall, Marietta, Ohio.

Claim—The employment of the shifting yoke, and in combination therewith of the spring, constructed substantially in the manuer set forth. 2d, The combination of the hook or part having a salient angle, constructed substantially as above set forth, with the inclined plane for closing and opening gates and doors.

283. BUREAU BEDSTEAD; Francis Hoffman, Assignor to self and John Muzell, City of New York.

Claim—A bureau bedstead, in which the bed bottom is hinged so as to fold and expand horizontally when opened or closed, as described.

284. COMPOSITIONS FOR ROOFING; Josee Johnson, Assignor to J. Ditto & Co., City of New York.

Claim—The use of mica for roofing, covering the sides of buildings and boat decks, as set forth.

285. WATER MOTORS; Caleb Rider, Plymouth, Assignor to G. T. McLauthlan, Boston, Massachusetts.

Claim—The union or combination of the following elements or features, viz:—1st, Making the inlet aperture of the tub, and the outlet apertures of the wheel of the same aggregate area. 2d, Forming the buckets of two planes or curves, the lower one making an angle of 26°, or thereabouts, with the plane of rotation of the wheel, and 90° with the float or upper portion of the bucket. 3d, Making the tub circular and of sufficient height and diameter to allow free action of the water therein, and causing the water to enter from the flume on a tangent thereto, whereby the inlet current is relieved from immediate and direct contact against the floats and buckets of the wheel, and caused to spend its force upon the waters already accumulated in the tub, and through that upon all the floats and buckets of the wheel itself, the whole forming a water motor, arranged substantially as dsscribed.

286. SEWING MACHINES; A. W. Sangster, Assignor to V. M. Rice, Joel Thayer, James Sangster, and Eliza Remington, Buffalo, New York.

Claim—The combination of the cam or wheel provided with one or more projections on its periphery, with the adjustable foot-piece, or its equivalent, for feeding the cloth and regulating the length of stitch in the manner described, and without the use of an intermediate feed-piece.

287. FORMING BATS FOR FELT CLOTH; M. D. Whipple, Charlestown, Assignor to A. B. Ely, Boston, Mass.

Claim—1st, Shortening the staple, in the manner and for the purpose substantially as set forth, previous to forming the bat. 2d, The combination of the draw rolls with a brush cylinder, a doffer, and a suitable device upon which to form the bat, operating in the manner substantially as described.

288. MACHINERY FOR FULLING CLOTH IN THE PIECE; M. D. Whipple, Charlestown, Assignor to A. B. Ely, Boston, Massachusetts.

Claim—Fulling or felting cloth in the piece by the action of rollers revolved alternately in one direction and the other, when the cloth is wound loosely on a spool, in the manner substantially as set forth.

289. MACHINERY FOR COMBING COTTON; M. D. Whipple, Charlestown, Assignor to A. B. Ely, Newton, Mass.

Claim—1st, The vibratory elastic feed rolls and permanent knife edge for holding the staple, as set forth. 2d, The combination of a feed for introducing the material into the machine, the vibrating card, and nippers, and the stationary cards, operating in the manner substantially as described.

EXTENSIONS.

1. METHOD OF RENDERING LARD; Ebenezer Wilson, Cincinnati, Ohio; patented October 9, 1844; re-issued May 7, 1850; extended October 7, 1858.

Claim—In the described apparatus for extracting or rendering lard, &c., by the action of high pressure steam, combining with a steam-tight tank, and provided with one or more discharge holes, for the discharge of the residuum, and with a perforated steam pipe at the bottom for the introduction of high pressure steam, a perforated false bottom above the steam pipe to sustain the charge under the weight and pressure, to admit of and insure free passage of the steam through the charge, and also the free descent of the water of condensation. Also, in combination with the tank, substantially such as herein described, the employment of one or more try cocks near the top thereof, and a regular discharge cock at or near the bottom, for the purpose of ascertaining when too much water of condensation has accumulated, and to discharge the same, to retain a

sufficient space above for steam to insure the pssage of steam through the charge. Finally, in combination with a tank, the employment of a series of discharge cocks arranged at different levels for the purpose of drawing off the rendered lard, &c., as it floats on the water of condensation, and thus insure the separation of the pure lard, &c., from all foreign substances, when this is combined with the relief or discharge cock, as described.

2. Steam Boilers; Frederick E. Sickles, City of New York; patented October 19, 1844; extended October 8, 1858.

Claim—1st, My improvement in the periods of the movements of the valves, by which they are opened and closed relatively to each other and to the movement of the piston, by means of which the piston completes each stroke in equilibrio, or nearly so, without admitting steam against the movement of the piston, by a lead to the steam valve, which is effected as before stated by opening the lower exhaust valve, before the end of the upward stroke of the piston, and before the upper exhaust valve is closed, and opening the upper exhaust valve before the end of the downward stroke of the piston, and before the lower exhaust valve is closed—the movement of the steam valves being so regulated as to admit steam to the cylinder only after the exhaust valve on the corresponding end of the cylinder has been closed. Also, as my next improvement, as a means of carrying into effect my first and essential improvement, the arrangement of the toes on the rock shaft in such manner relatively to the location and forming of the feet on the lifting rods, that at the middle, or nearly so, of the rocking motion of the rock shaft, both lifting rods, with their exhaust valves, shall be partly up, as described. Also, in combination with this arrangement, the slip of the lifters on the steam valve stems, to ensure the closing of the exhaust valves before the opening of the steam valves on the corresponding ends of the cylinder, as described.

Additional Improvement.

1. Metallic Hoops for Fastening Cotton Bales; James R. Speer, Pittsburgh, Pennsylvania; patented Dec. 1, 1857; additional dated October 26, 1858.

Claim—As an improvement on my improved clasp of March 23, 1858, the use of a clasp for metallic bands, constructed as described, having a single aperture only for the insertion of the hooked ends of the band, the plate of iron of which it is formed being bent across the aperture, so as to present a sufficient opening for the ready insertion of the hooked ends of the bands, in the manner described.

Re-Issues.

1. Manufacture of Paper from Wood; Wm. F. Ladd, City of New York, and Morris L. Keen, Philadelphia, Pennsylvania, Assignees (through mesne-assignment) of Charles Watt and Hugh Burgess, London, England; patented July 18, 1854; ante-dated August 19, 1853; re-issued October 5, 1858.

Claim—The pulping or disintegrating of shavings of wood and other similar vegetable matter for making paper, in the manner substantially as described, according to the nature of the vegetable substance to be treated.

2. Wear Iron for Carriages; I. George Lefler, Philadelphia, Pennsylvania; patented Sept. 8, 1857; re-issued October 5, 1858.

Disclaiming the formation of "goose-necks," or recesses in the bodies of vehicles, and disclaiming the use of metallic guards or "wear irons."

Claim—Without limiting myself to any precise form or exact proportion, the construction of carriage or other bodies with a metallic recessed guard, constructed and arranged in the body of the vehicle, substantially as described, for the purpose set forth.

3. Cleansing Sugar; Francis P. Hurd, Assignee (through mesne-assignment) of Joseph Hurd, Stoneham, Mass.; patented Oct. 3, 1844; extended Oct. 2, 1858; re-issued October 5, 1858.

Claim—1st, The process of separating sugar from any liquid matters with which it may be mixed, by filling the mixed mass into a vessel constructed and then acting upon the same by centrifugal force, substantially in the manner specified. 2d, The washing of impurities out of the sugar, by admitting a liquid into a vessel in which sugar is being exposed to the action of centrifugal force, as specified. 3d, The process described of obtaining a mass of sugar free from liquid impurities by filling the mixed mass into the top of a vessel, constructed substantially as described, and having a closed bottom, and there exposing the mass to the action of centrifugal force, and then withdrawing the sugar out of the upper end of said vessel when separated. 4th, The process of obtaining a mass of washed sugar by charging sugar into the top of a vessel, constructed as specified, with a closed bottom, and then exposing such sugar to the action of centrifugal force, and while so exposed, admitting currents of liquid to wash the sugar. Finally, withdrawing the washed sugar out of the top or upper end of the vessel, as specified.

4. Dry Gas Metres; Alexander A. Croll, London, England; patented February 22, 1853; re-issued October 5, 1858.

Claim—Fastening the diaphragms to the partition plate, and on either side thereof, in contradistinction to attaching them by separate flanch rings to the sides of the metre, and at or near the front and back thereof. Also, the arrangement of pendant rods or levers, with suitable guides near the outer edges of the disks on opposite sides of their axis, to steady and direct the motion of the movable partitions, as described. Further, continuing the inlet and outlet pipes down the sides of the rectangular case, below the points required for the passage of the gas to and from the metre, to form separate condensation chambers. Likewise, enclosing by a separate interior cover or case, the valves of the metre, for protection of the operating and registering gear from gas, and to facilitate adjustment, substantially as set forth.

5. Chairs; James Fernald, Boston, Massachusetts; patented July 22, 1856; re-issued Oct. 12, 1858.

Claim—The new manufacture of chair backs, composed of a convex-faced solid block of wood, and a single metallic support rod, they being constructed and applied together and to the chair seat, essentially as specified. Also, making the back rest oblong or oval, when made to rotate in the manner specified.

6. Bolting Flour; Edward Broadfield, Rochester, New York; patented September, 1846; re-issued October 12, 1858.

Claim—1st, The cast heads or annular rings with the flanch and hubs, or any mechanical equivalent therefor, when used in connexion with wire cylinder or circular wire bolt. 2d, In combination with the chain, the cylindrical journals, or their equivalents, by means of which the bolt revolves in or on a support inside the space for admitting the feed instead of on the outside, as in the English bolt. 3d, The combination of the

cards or metal points and brushes, attached to bars of the inside cylinder, for the purpose specified. 4th, The spout, when arranged in relation to the cylinder or bolt, and used in connexion with said cylinder or bolt, and the inside brush cylinder, as specified.

7. SEWING MACHINES; The Grover and Baker Sewing Machine Co., Boston, Assignors of Shelburne C. Bloodgett, Georgetown, Massachusetts; patented December 20, 1853; re-issued October 12, 1858.

Claim—The formation of sewing in cloth or other material, by the interlooping of two threads by the conjoint action of two needles, in such manner that each needle shall be made to carry a loop of thread through a loop formed by the other needle and through the cloth, whereby one thread serves as a binding thread to the other, substantially in the manner described. Also, moving the cloth to be sewed by a needle, or its equivalent, operating substantially as herein set forth, to pierce the cloth and move it the necessary distance required to form successive stitches.

8. VENTILATING ATTACHMENT TO BE APPLIED TO PUMPS; G. C. King, Assignee of C. N. Lewis, Seneca Falls, New York; patented November 17, 1857; re-issued October 26, 1858.

Claim—The arrangement and combination of the perforated base, cap, and perforated tube, or other equivalents, with the pump barrel, as set forth, whereby the ventilator becomes attached to, and forms a part of, the pump.

9. ELLIPTIC CUSHION FOR RAILROAD CARS; R. Jones, York, Pennsylvania; patented April 27, 1858; re-issued October 26, 1858.

Claim—1st, The local relation and mode of application of the semi-elliptic buffer to any and all cars where-ever applied, in such manner as is represented by the letters, and for the purposes set forth. 2d, The combination and arrangement of the elliptic cushion for easing off collisions, as described, and arranged in every part thereof, in the frame work, as represented by the letters, and operating substantially in such manner, and wherever applied to cars, as described, and for the purpose set forth.

DESIGNS.

1. CAST IRON FENCES; Martin Briggs, Rochester, New York; dated October 5, 1858.
2. TRADE MARKS; Richard P. and Charles Bruff, and George A. Scaver, City of New York; dated October 5, 1858.
3. COOKS' STOVES; N. S. Vedder, Troy, Assignor to G. W. Eddy, Waterford, New York; dated Oct. 5, 1858.
4. CAST IRON FIRE SHOVELS; Wm. Bennett, City of New York; dated October 12, 1858.
5. LOCKETS; R. C. Randall, Providence, Rhode Island; dated October 19, 1858.
6. CAST METAL TABLETS; Ezra Clark, Portland, Assignor to Seth Clark, Westbrook, Maine; dated Oct. 26, 1858.

MECHANICS, PHYSICS, AND CHEMISTRY.

*Ice Phenomena, from Observations on Rice Lake.** By J. H. DUMBLE, C. E.

The phenomena attending ice are, I believe, but little understood or investigated in Canada. That water increases in bulk during the process of crystallization is well known. The mere facts, that ice floats on water, and that vessels of any description which contain water fracture while it is congealing, are proofs sufficiently practical. But that ice itself should be capable of expanding and increasing in bulk is not equally well known, although many practical proofs are afforded.

This property of expansion and contraction of ice aids in fracturing and reducing the floating and gigantic iceberg; and Dr. Kane tells us, that but for changes of ice at temperatures *far below the freezing point*, causing pressure, collapse, fracture and disruption, the short Arctic summer would fail to open the Arctic Seas. I may add, that the ignorance, or want of a proper appreciation, of the properties of ice, evinced in the construction of numerous wharves, piers, and bridges on the inland lakes and rivers of Canada and the Northern States, has proved a source of infinite annoyance and of immense expense.

The Cobourg and Peterborough Railway bridge across Rice Lake supplies a remarkable instance, from observations of the effects of ice

* From the Canadian Jour. of Industry, Science, and Art, Sept., 1858.

on which some valuable practical conclusions may be deduced. Timber being plentiful along the shores of this lake, a cheap and substantial form of pile and truss bridge was constructed.

This bridge on more southern waters would doubtless have been considered a most suitable structure, but owing to the violent and almost irresistible force of ice, while expanding, a considerable portion of this structure now presents the appearance of a complete wreck. Having, as Engineer of the Cobourg and Peterborough Railway, had two winters' experience of ice phenomena on Rice Lake, and having carefully noticed the peculiar circumstances attending the various movements of the ice, I submit my observations and remarks, hoping that from them a somewhat satisfactory and perhaps correct theory may be deduced.

In the first place, it is well to know, that the violent movement of the ice on Rice Lake is that of contraction and expansion, caused entirely by *change of temperature*. The lake generally "takes" with ice during the month of December at a pretty high water level, which level the dam across the outlet preserves until spring. Currents, therefore, cannot be said (as in the case of rivers) to influence the movements of the ice. Neither have we on Rice Lake those other various causes, such as differing temperatures of ice and sea water, currents, or wave action, which produce the disruptions of Arctic ice. It is observed on Rice Lake that the action of the mid-day sun will set the *glare ice* immediately in motion. Warm winds, snow storms, and rains, do likewise produce the same effect, when the ice is glare and free from water or snow. This motion is generally quite perceptible; it is not shrinkage or contraction, but on the contrary is a visible stretching and expanding of the field-ice, generally towards the shores of the lake and of islands. The movement of the ice is at times very gradual, and is accompanied by a slight crackling noise. Again the expansion is rapid and violent, the movement being by a succession of vigorous jerks, accompanied by a hollow rumbling sound, seemingly from under the field-ice, while at intervals there occur sharp loud reports like that of cannon.

That ice does *expand* under such circumstances is very evident, as it may be seen creeping many feet on to the shores, without the appearance in the lake of any compensating fissures whatever. Ice may therefore be said to expand by a *high temperature*, that is, by a temperature higher than that which had just previously existed. The phenomena of ice contracting and expanding at the same temperature on different occasions is sometimes witnessed. For instance, should the thermometer indicate a temperature of minus 30°, and then suddenly rise to zero, expansion would immediately be the result; again, should the temperature indicate plus 30°, and suddenly fall to zero, contraction of the ice would speedily follow. The force and violence with which ice expands or shoves depends entirely on the *extent* of the *change* of temperature. The most violent shoves of ice occur previous to rain storms. A rise in temperature of 20° or upwards produces violent expansion. Various instances may be cited of the effects

produced by ice when expanding; evidence of its power is very indelibly written on parts of the Railway Bridge before-mentioned. Portions of this structure on piles have been, for long distances, bent and inclined even to an angle of 45° in a most uniform and extraordinary manner. Strong oak piles that would not bend have been cracked and splintered, hundreds of heavy cap timbers of sound pine have been snapped across like reeds, and heavy iron rails have been curved and doubled up, by the almost irresistible pressure of the ice.

Instances of trees growing on the shores having been torn up by the roots are of frequent occurrence. Large boulders weighing two tons or more, have been lifted several feet from the shore, and then pressed into the timbers forming the abutments of the bridge.

Channels cut for the purpose of moving timber frequently close by the expansion of the field ice, and the timbers are heaved out high and dry.

The greatest amount of expansion that I have witnessed at any one time in a horizontal direction was six feet. This may be considered a maximum shove.

When ice shoves on to the shores of lakes or islands it presents different forms of fracture, according to the nature of the resistance it meets with. Should the shore be low the ice merely runs up and fractures at the ripple mark. On the contrary, should the ice meet with resistance from a vertical shore or pier, a bursting up and piling of the fractured pieces would be the result.

Ice when contracting presents precisely the reverse of this fractured appearance. From my experience of ice I believe it is susceptible of contraction, but to a very limited extent. I have witnessed many sudden changes of temperature on Rice Lake, in some instances from plus 30° to minus 20°, indicating a fall of some 50°; and yet the contraction of the ice, as made visible by open fissures, has not exceeded three inches.

I have repeatedly heard of openings, that have occurred during former years, of several feet in width. I am inclined, however, to believe, that the distinction between a shove and an open crack, or fissure, was not sufficiently understood by my informants.

I have witnessed in several shoves that when the ice contracted, the fractured and elevated pieces, which previously came in contact with each other, would fall, and perhaps partly under the field-ice. A space in the centre thus presented open water. This open water has probably been mistaken for a fissure caused by contraction.

I have heard of open fissures that have been seen eighteen inches in width, and this I think under peculiar circumstances, quite probable. That these fissures do sometimes occur, and that they never do occur unless the thermometer indicates a decided fall of temperature, is sufficient proof that ice contracts by a change to a temperature lower than that which had just previously existed. I may add, that contraction occurs generally at night, and is accompanied by sharp reports. A uniform temperature of the atmosphere does not cause either expansion or contraction of ice; it matters not whether the

temperature be high or low, no movement of any kind takes place. A coating of snow of any depth over six inches effectually prevents any motion in ice, by protecting it from the influences of the atmosphere.

I find from repeated experiment that the upper stratum of ice partakes of the temperature of the atmosphere (up to 32°). The lower stratum maintains a constant temperature of some eight degrees below that of the underlying water. A fall of temperature, therefore, affects only the upper stratum, while the lower stratum remains unaffected. A separating and fracturing of the mass at its weakest point must of course be the result. Just the contrary effect is produced when the upper stratum is affected by a high temperature; shoving and overlapping is the consequence.

Ice, unlike most other solids, does not seem to possess the property of contraction to the same extent as it does the power of expansion. This will seem apparent from the following evidence:—When ice expands, and is forced perhaps six feet on to the shore, it is observed that should the temperature again fall, this ice, which had previously exceeded its limits, does not recede to its former position, neither will the main field separate over a few inches from the fractured portions on the shore. On the contrary, should the temperature again suddenly rise, a still further advance of perhaps the same distance is made on to the shore.

This repeated expansion may occur many times during a winter, and yet little evidence of any contraction will appear. I have known channels some six feet in width, opened for the purpose of isolating the Rice Lake bridge, to be closed eight times within a month by the expansion of the field-ice.

An extraordinary instance of ice piling was witnessed on our new embankment. The ice shoved from both sides until the fractured pieces met in the centre of the track. The embankment is twenty-six feet in width at water level, and the rail is some six feet elevated.

The next phenomenon of ice, and that which seemed the most perplexing and difficult to account for, is the fact of ice shoving from different directions at different periods. In the first place it was noticed that it rarely or never shoved or fractured towards the centre of the lake; but on the contrary, the ice on the shores of the lake and of islands exhibited unmistakable signs of commotion.

It is but reasonable to suppose that any solid, equally dense throughout its dimensions, and susceptible of expansion, would, when equally acted upon by the active agent or moving cause, expand from its centre towards its circumference. We find such is the effect produced on any large field of ice of equal thickness and density, when acted upon uniformly by either the mid-day sun or warm winds. It is a fact, however, that it moves from other directions than from the centre of the lake. Shoves are sometimes witnessed from the east and sometimes from the west, to the north and to the south.

This phenomenon seemed as if it would baffle investigation, and it was only by careful observation of all the circumstances attending the

formation and movements of the ice that I could deduce a theory to my satisfaction. It would perhaps be well to describe that portion of Rice Lake which came within my observation. The railway bridge crosses the lake at its widest part. An island, containing some three acres of land, is situated on the line of the bridge, about three-fourths of a mile from the south shore. The bridge is formed of pile bents, with the exception of that portion immediately to the north of Tic Island, which is a continuous truss for half a mile. To the east is a wide and unobstructed expanse of water ; at the distance of perhaps four miles from the bridge, the lake is narrowed by two promontories to a mile in width. Less than a mile to the westward a succession of beautiful islands rise from the lake. The Otonabee River, a large sluggish stream, enters the lake opposite those islands from the north. We have then at this particular part of the lake some twelve square miles of water-way. When this large space is therefore covered with glare ice, and is swept by warm winds after a previous low temperature, the amount and force of its expansion is somewhat surprising.

An instance of expansion from the centre of this large field may be cited:—In December, 1857, the lake was covered with dense glare ice five inches in thickness. The temperature was extremely low (ranging from minus 10° to minus 30°) for some time after the ice formed, it suddenly rose to plus 30° previous to rain. The expansion that followed was of the most violent description. The truss bridge superstructure moved two feet six inches on to Tic Island; the pile bridge south of the island was forced four feet and a half on to the south shore. The bridge was slightly shoved to the north, but was mainly preserved by the parallel channels that happened to be open for the purpose of isolating it in that direction. The centre of the bridge was not affected in the slightest, it being the neutral point. The ice was piled on to Tic Island from the north, east, and west, but on the south side it was torn away from the shore, exhibiting a fissure or opening some twenty inches in width.

Instances of the ice shoving on to the north and south shores of the lake, and also on to the shores of islands at the same time, are frequent. In fact, when the ice is equally dense and glare, and being fairly acted upon by a warm atmosphere, it must naturally expand from its centre to its circumference. But ice, owing to the peculiar circumstances under which it sometimes forms, is not found to be equally pure or dense, neither is it of uniform thickness. This ice is irregularly acted upon by warm winds, or by the slanting rays of the sun at different altitudes, shoves or expands from various directions other than from the centre of the lake. During the early part of the last winter the ice shoves were entirely from the east, in the vicinity of the bridge. Upon an examination of the ice, I found that to the eastward glare and dense, the ice to the west of the bridge was not so pure, but was seemingly thicker and more porous. This difference in its character was owing to snow having fallen during its formation; the bridge had retained the snow to the westward, and it became incorporated with the new ice.

The large open expanse to the east was constantly swept by the wind. The glare ice became the most dense during cold weather, and of course the most susceptible of expansion by heat. Consequently the shoving was (until subsequent rains had changed the relative character of the ice) from the stronger and most susceptible ice towards the weaker and less expansive.

Ice on any large and irregular sheet of water studded with islands, like Rice Lake, must naturally be of unequal thickness and density. I have therefore no doubt whatever, that the phenomenon of ice expanding and shoving from various directions is caused by the *unequal thickness*, *density*, and *glareness of the ice*, and likewise by the *manner* in which the *heated atmosphere strikes it.*

The fact that channels opened in the lake (no matter whether transversely or longitudinally,) always close up on the ice exhibiting the slightest tendency to expansion, is another proof that ice invariably expands and shoves to the line of such least resistance, and under peculiar circumstances from a general centre of the field.

On mentioning these circumstances to a friend from Kingston, he asked: "If ice moves from the centre of the mass, why is it, that it does not do so between Kingston and Wolf Island?" and stated, that on the contrary, a longitudinal shove and fracture are generally witnessed in the middle of the stream. I replied that the centre of the stream was generally the last to take, and being consequently the weaker ice, was sure to be crushed and fractured by the stronger ice on each side while expanding. I heard a seaman state, that he discovered the channel of a harbor (formed by the entrance of a river into the Black Sea,) by the appearance of an irregular line of fracture in the ice.

Another instance of ice expanding towards the line of least resistance may be cited:—When Presque Isle Harbor is entirely frozen over, any expansion of the ice is apparent by its encroachment on the shore. But when the bay is but partially frozen over the expansion is towards the open water, and is not visible on the shores.

In conclusion, I would mention another circumstance that occurs during the expansion of ice. It is observed, that when a large extent of field-ice expands towards the shore it does not shove into deep bays, but fractures from point to point, in a zigzag manner across the chord at the mouth. The thrust of the main field must find less resistance across this chord than around the area of the bay.

Ice is a most delicate thermometer, and from the brief statement of facts connected with its phenomena the following general inferences may be derived:

1st. That ice is capable of expansion and contraction.

2d. That ice (up to 32°) expands with a temperature *higher* than that which *had just previously* existed.

3d. That ice contracts with a temperature lower than that which had just previously existed.

4th. That ice does not expand or contract with a uniform temperature.

5th. That ice is susceptible of expansion to a much greater extent than of contraction.

6th. That when ice is equally dense, thick, and glare, and equally acted on by a heated atmosphere, it expands from the centre towards the circumference.

7th. That ice expands towards the line *of least resistance.*

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*Vegetable Parchment.**

Several of our readers are doubtless aware that an invention was not long ago brought before the public, by which common unsized paper was converted into a substance strongly resembling parchment, and which received the name of vegetable parchment or parchment paper. Mr. Gaines was the inventor, but the working of the invention has been undertaken by Messrs. T. De La Rue & Co. The process consists in immersing the paper for a few seconds, in sulphuric acid, diluted with half its volume of water—the acid being afterwards got rid of. The substance thus produced has been submitted to Dr. Hoffman, the eminent chemist, a copy of whose interesting report is now before us; and our readers will probably be glad to have the substance of it laid before them. The substance (says the doctor) exhibits in most of its properties so close an analogy with animal membrane, that the name adopted for the new material seems fully justified. In its appearance, vegetable parchment greatly resembles animal parchment; the same peculiar tint, the same degree of translucency, the same transition from the fibrous to the horn-like condition. Vegetable, like animal parchment, possesses a high degree of cohesion, bearing frequently repeated bending and re-bending, without showing any tendency to break in the folds; like the latter, it is highly hygroscopic, acquiring by the absorption of moisture increased flexibility and toughness. Immersed in water, vegetable parchment exhibits all the characters of animal membrane, becoming soft and slippery by the action of water, without, however, losing in any way its strength. Water does not percolate through vegetable parchment, although it slowly traverses this substance like animal membrane by endosmatic action.

After remarking that to produce a perfect result, attention must be paid to the exact proportion of acid and water, the time of immersion, and the temperature; and after stating that he had proved experimentally that the acid had produced no chemical change in the constitution of the paper, but had caused only a molecular arrangement of the constituents, he says, that he next proceeded to ascertain whether the process employed to remove the sulphuric acid from the paper had produced the desired effect. If any acid remained, the destruction of the paper, within a greater or less period of time, was certain. Now, the process consists in long continued mechanical washing with cold water, immersion in a dilute solution of caustic ammonia, and, lastly,

* From the London Practical Mechanics' Journal, October, 1858.

renewed washing with water. This process was found, on analysis, to have been attended with complete success; for not a trace of free sulphuric acid could be found.

The doctor then performed some experiments on the strength of this material, as compared with that of the animal parchment, with which it is likely to enter into competition. For this purpose, bands of vegetable and of animal parchment both $\frac{7}{8}$ of an inch in width, and as far as possible of equal thickness, were slung around a horizontal cylinder, and appropriately fixed by means of an iron screw clamp pressing both ends upon the upper part of the cylinder. The band assumed in this manner the shape of a ring, into the bend of which a small cylinder of wood was placed projecting on each side about an inch over the band, and carrying by means of strings fastened to each end a pan, which was loaded with weights, until the band gave way. A set of experiments made in this manner led to the result, that paper by exposure to the action of sulphuric acid in the manner described, acquires about five times the strength which it previously possessed, and that for equal weights, vegetable parchment possesses about three-fourths of the strength of animal parchment. It was found, moreover, that bands of vegetable parchment taken from different sheets of the same kind of paper, exhibited a remarkable uniformity of strength, whilst in animal parchment, which, owing to its mode of manufacture, must always present considerable inequality of thickness, extraordinary variations were observed, even if the bands were taken from the same skin. Vegetable parchment, then, as far as strength goes, is not quite equal to animal parchment. On the other hand, the new article greatly surpasses real parchment in its resistance to the action of chemical agents, and especially of water. As has been already stated, vegetable, like animal parchment, absorbs water and becomes perfectly soft and pliable; but it may remain in contact, and even may be boiled with water for days, without being affected in the slightest degree, retaining its strength, and regaining its original appearance on drying; on the other hand, it is well known how rapidly animal parchment is altered by boiling water, by the protracted action of which it is converted into gelatine. Even at the common temperature, animal parchment, in the presence of moisture, is very prone to putrefactive decomposition; whilst parchment paper, in which nitrogen, this powerful disturber of chemical balance, is absent, may be exposed to moisture, without the slightest change either in appearance or properties. It would in fact be difficult to find a paper-like material endowed with greater power of resistance to the disintegrating influences of water than vegetable parchment.

Taking into consideration the chemical composition of the new material, its cohesive power, and its deportment with chemical solvents, especially water, both at the common temperature, and at the temperature of its boiling point, it is obvious that this substance unites in itself, in a most remarkable manner, the condition of permanence and durability; and there need be no hesitation in stating that vegetable parchment, properly prepared, is capable of resisting the tooth of time for many centuries, and that under various circumstances it will last even longer than animal parchment.

The valuable properties of vegetable parchment suggest a great variety of applications for the new material. There is no doubt that parchment paper may be adopted, with perfect security, for all legal documents, policies of insurance, foreign bills of exchange, bills of lading, scrip certificates, and other similar documents, as a substitute for the skins which are now generally used. On the other hand, its comparatively low price would appear to suggest its application in a variety of cases, in which, at present, paper is employed; for instance, for private ledgers of banking houses, or other large establishments, as well as for registries of wills, marriages, baptisms, and deaths, indeed, for all documents the preservation of which is of importance. Many of the documents in question, in order to protect them from injury in case of fire, are generally kept in safes, the majority of which are now encased with solid water,—the water of crystallization in alum, and other similar hydrated compounds. The interior of these safes, in case of exposure to heat, must obviously become filled with steam of a high temperature, and it cannot be doubted that documents written on vegetable parchment, owing to the extraordinary power with which this material resists the action of boiling water and of steam, will stand a much better chance of preservation under such circumstances, than those written on common paper or animal parchment.

As another advantage of vegetable parchment, as compared with animal parchment, the experience may be quoted, that vegetable textures are much less attractive to insects than animal structures. Moreover, to increase the security of vegetable parchment in this respect, the paper, before conversion, may be incorporated with chemical agents which, like salts of mercury, for instance, have been employed with such advantage in the manufacture of paper for public records. Another advantage is, the great difficulty with which words are erased from its surface, and others are substituted in their places. Deeds written on parchment paper acquire thereby a certain degree of security against falsification.

Its strength and resistance to water appear to recommend parchment paper in an eminent degree for engineers' and architects' plans, and especially for their working plans, which are often unavoidably subjected to rough usage and moisture. The thinner sheets of parchment paper, on account of their transparency, present the additional advantage of being useful as a most durable tracing paper. Another field of considerable extent for the application of vegetable parchment appears to be in book-binding, especially ornamental. Books bound in parchment paper are remarkable for the beauty and solidity of their binding. Experienced book-binders, to whom these were submitted, believed them to be bound in real parchment. Even in the manufacture of books and maps, which, like those used for educational purposes, have to stand considerable wear and tear, parchment paper may find a very useful application. The printing on ordinary paper is not changed by the treatment with sulphuric acid, but owing to the shrinking of the paper during the process, it will probably be found more convenient for such purposes to print on the paper after it has undergone the transforma-

tion. Vegetable parchment is remarkable for the facility with which printer's ink, as well as writing ink, may be applied to it, and for its attraction for dyes generally, many of which it appears to take even more readily than calico.

Among the numerous more or less important applications in which parchment paper is sure to be found useful as soon as it becomes accessible to the general public, its adaptation for household, and especially for culinary purposes, must not be left unmentioned.

In closing the orifices of vessels for preserves, &c., few housewives will hesitate to substitute an elegant material like vegetable parchment paper for animal membrane, which is now generally in use.

Formed into bags of which the seams are cemented with the white of egg, parchment paper will be found very useful for the purposes of boiling and stewing, according to the principles of a refined and scientific *cuisine.*

Nor can the chemist fail to derive some benefit from so interesting an achievement of his own science as the transformation of paper into parchment. In the laboratory, vegetable parchment will become a material of general use for connecting retorts and condensers, or other similar apparatus, and on account of its indestructibility by many of the fluids usually employed in electric batteries, it will probably find a further and even more important application in the construction of diaphragms for galvanic apparatus.

Lecture on some of the Improvements in Locks since the Great Exhibition of 1851.* By Mr. Edmund Beckett Denison.

After adverting to the mode in which the old Bramah and Chubb locks had been picked by Mr. Hobbs, of picklock fame, Mr. Denison stated his belief that there was still a notion prevailing among persons, who ought to know better, that the picking of locks by this method required singular skill and dexterity, such as need not be feared from ordinary lock-pickers. This was quite a mistake, now that the method is so well known to every body in the lock trade, and to all who take the trouble to look into any books on the subject. He stated that the long delay of the thieves who opened the box with a Chubb lock on the South Eastern Railway, in the gold dust robbery, only proved that they were greatly ignorant of their business. Any moderately good hand, among, not merely Mr. Hobbs', but Mr. Chubb's own workmen, would have opened the box and shut it up again between London and Reigate. Indeed, in a trial before Lord Campbell, a few years ago, one of Mr. Chubb's men confessed, that the picking of one of his locks, or of any others then known to him, was merely a question of time; and Mr. Hobbs has several times said in public, that he is acquainted with persons, both in the trade and out of it, who can pick locks quicker than he can, now that the proper way of doing it is known. The lecturer strongly recommended, for cheapness and comparative safety,

* From the London Practical Mechanics' Journal, October, 1858.

Tucker's, Parvell's, and Hobbs' small locks. He stated that one of the good effects of the exposure and defeat of our best locks had been the invention of a greater variety of really different locks, in the last six years, than in the previous sixty or six hundred. The greater number of locks now made has induced the formation of an establishment by Mr. Hobbs for their exclusive factory, and in which, like Colt's revolvers and the American clocks, they are made by special machinery. The small prices at which they are sold is, of course, the result of this mode of construction. It was stated that the common three-inch drawer locks, with four tumblers, equal to the best of 1851, are now sold at 27*s.* a dozen. The principle of all locks above the rank of the common warded locks, whatever may be the details of their arrangement, is this:—There are a number of similar pieces (which may have the name of tumblers, levers, sliders, disks, rings, or pins, according to circumstances,) each with a notch in it in a different place, and until all these notches are brought together into one given position, the pieces in question, or some of them, prevent the passage of another piece in the lock, on which its opening depends. Mr. Denison exhibited a model, made not to resemble any particular lock, but to illustrate this general principle of them all; and he showed on it the application of the "tentative" mode of picking, by applying pressure to the bolts, and then gently moving each of the tumblers or sliders, &c., in succession, on which any pressure is felt, until all the notches come under the piece which has to enter them, and then the bolt yields to the pressure and goes back. The lecturer gave a synopsis of some improvements which had been made, and referred with much commendation to the first invention which really defeated this lock picking, by Mr. Hobbs, in what he calls his "protector" or movable stump lock. In this, as soon as you try to make the bolt press upon the tumblers, the pressure is taken off them altogether, and transferred to a fixed pin in the lock, which would prevent it from being opened in that state of things, even if all the tumblers were then raised to the proper height. This is done by the movable stump, the action of which is freely described in the rudimentary treatise on locks in *Weale's Series.* Mr. Denison said that this invention, in its present form, is perfectly effectual against any mode of picking yet known. He then described a lock of his own invention, not intended for furniture and small work, but for doors of safes, prisons, and other places where strength and security are required.

Before the Royal Institution.

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*Type Map.**

A telegraphic map of Europe, entirely executed in typography, has been presented to the Society by Mr. R. Decker, of the Royal Printing Office, Berlin. It is the work of Mr. A. Mahlan, who is employed by Mr. Decker in the above establishment. It is remarkably clear and beautiful. The process by which it has been produced is described as

* From the Journal of the Society of Arts, No 293.

follows: —The drawing of the map, made on paper, is blackened at the back with a carbonic tracing composition, and is placed, blackened side downwards, on a surface composed of quadrats, formed each by sixteen nonpareil squares, and by means of a point the lines are transferred to them. The quadrats over which the lines are traced are then exchanged for nonpareil type, cast with a face of points, and the coast line is formed by the inner portion of these points being cut away. The telegraphic lines are formed of brass rules, fixed in nonpareil type body, as a sort of legs, which can be inserted into the composition, when needed, by taking out the quadrat, the legs being so adjusted in length that the upper edge of the rule is level with the face of the type. The additional shading of the coast line is effected by the insertion of nonpareil type cast with points on the face. The names of places are inserted by means of type taking the place of the quadrats where required.

The effect produced is peculiarly good. How far this is ever likely to supersede the present methods of producing maps by engraving and transfer to lithographic stone, is questionable; no details as to the cost are given, and it seems very doubtful (however simple the process appears,) whether the result can be satisfactorily produced except by a skilled workman, whose labor must be adequately remunerated.

A new form of Mercurial Barometer.

M. de Celles exhibited to the Academy of Sciences of Paris, a mercurial barometer constructed under his direction. This barometer is the instrument of Torricelli, with the following modifications: 1st, the diameter of the barometric chamber is increased in proportion as it is desired to make the instrument more sensitive; 2d, the cistern is replaced by a horizontal tube 0·15 ins. or 0·2 ins. in diameter, and of a length proportionate to the sensibility of the instrument. The instrument has the form of a square. Slight variations of the height of the vertical column correspond to considerable, but always proportional movements of the horizontal leg. This ratio is inversely as the squares of the diameters. An index of iron placed in the horizontal tube is pressed outward while the pressure of the air is diminishing, and is left when the column returns. It marks the minimum pressure, and may be brought back by a magnet. M. de Celles claims for this instrument the three advantages: 1st, of very great sensitiveness. 2d, a constant level. 3d, a minimum index.

FRANKLIN INSTITUTE.

Proceedings of the Stated Monthly Meeting, December 16, 1858.

John C. Cresson, President, in the chair.

John Agnew, Vice President. John F. Frazer, Treasurer. I. B. Garrigues, Recording Secretary.	Present.

The minutes of the last meeting were read and approved.

Letters were read from the Royal Society, of London, and James Eives, of London; the Royal Cornwall Polytechnic Society, Falmouth, England, and L. A. Huguet-Latour, Esq., Montreal, Canada.

Donations to the Library were received from the Royal Geographical Society, and the Institute of Actuaries, London; the Royal Irish Academy, Dublin, Ireland; L. A. H. Latour, Montreal, Canada; the Fire Department of the City of Detroit, Michigan; the Commissioners of Indian Affairs, Washington City, D. C.; William Lenoir, of Lenoirs, Tennessee; Dr. Charles M. Wetherill, Lafayette, Indiana; Charles E. Smith, Esq., Dr. Isaac N. Kerlin, Messrs. Merrick & Sons, John E. Addicks, Esq., Dr. L. Turnbull, Dr. B. H. Rand, and Geo. M. Conarroe, Esq., Philadelphia.

Donations to the Cabinets were received from Walter Cresson and Amos A. Jones, Esqs., Philadelphia.

The Periodicals received in exchange for the Journal of the Institute, were laid on the table.

The Treasurer read his statement of the receipts and payments for the month of November.

The Board of Managers and Standing Committees reported their minutes.

The Committee on Exhibitions presented so much of their Report on the late Exhibition, as refers to the specimens of velvet and gold stamped paper hangings, by Messrs. Howell & Brothers, of Philadelphia, for which they recommend the award of the Gold Medal. And, also,

To the specimens of mousseline de laine, by the Manchester Print Works, of New Hampshire, and the gas fixtures, by Messrs. Cornelius & Baker, of Philadelphia, for which they recommend to each the award of a Recall Gold Premium.

On motion, the awards were made in accordance with the Report.

Fifty-nine resignations of membership in the Institute, were read and accepted.

Candidates for membership in the Institute (141) were proposed, and the candidates (6) proposed at the last meeting were duly elected.

Prof. John F. Frazer announced the death of Mr. Owen Evans, and offered the following resolutions, which were seconded by John E. Addicks, Esq., and unanimously adopted:

Resolved, That the Franklin Institute has heard with great regret, the announcement of the death of their late fellow-member, Mr. Owen Evans.

Resolved, That as a member of this Institute of twenty-four years' standing; for fourteen years an active member of its Committee of Exhibitions, and of its Board of Managers, he always commanded the admiration of his fellow-members for his zeal and energy, and endeared himself to them by his amiable manners.

Resolved, That the Corresponding Secretary be directed to communicate to the family of the deceased, the expression of our sympathy in their affliction.

Nominations were made for Officers, Managers, and Auditors of the Institute for the ensuing year.

On motion, it was

Resolved, That the polls for receiving the votes of the members of the Institute for Officers, Managers, and Auditors for the ensuing year, at the Annual Election to be held on Thursday, Jan. 21st, 1859, shall be opened at 3½ o'clock, and closed at 8 o'clock, P. M., and that seven members be appointed by the President a committee to receive the votes, and report the result thereof.

Messrs. Field & Hardie furnished one of Mr. L. C. Stephens' "Patent Combination Rules," a full description of which will be given in the *Journal* for next month.

Mr. G. Curtis exhibited a patent Horse Hoe, the invention of Mr. Lorin Wetherill, of Worcester, Mass. It is designed for hoeing corn, potatoes, cotton, or other field crops that are grown in rows or drills; and is adapted to the condition of the plants in any stages of their growth. It consists principally of a double mould-board plough, having at its rear sides two sets of hoes or paddles, affixed to the ends of arms that rotate in planes perpendicular to the furrow made by the plough. Motion is given to these arms by shafts driven by gearing moved by a wheel running upon the ground just in advance of the plough. The shafts can be raised or lowered at the ends carrying the hoes, in order that a lesser or greater quantity of earth may be thrown by them upon the hills surrounding the roots of the plants. The clods are broken by the hoes into small pieces, which consequently lay more closely about the roots.

It is claimed to be an efficient and labor-saving machine, hoeing as much ground in one day as the draft animals can pass over.

BIBLIOGRAPHICAL NOTICES.

The Coast Survey; its Costs, Abuses, and Power. From the New York Times.

The pamphlet before us with the above title, contains a violent attack upon the Coast Survey, or rather upon its superintendent; but the malice and personal spite of the writer is so marked upon every page and almost every paragraph of it, that were it to meet the eyes of intelligent men only, it would scarcely merit a notice in reply.

From the character of the writing, however, and the great exertions which have been made to distribute it wherever it might do harm, it is evidently intended to furnish a pretext, rather than a reason, for an attack upon this important work, and the silence of those who know its falsity, was not improbably one of the elements calculated on to secure its success.

Fortunately, our duty does not call on us to follow the writer in his

mere personal abuse; the fact which underlies this very pamphlet, the great personal popularity and influence of Mr. Bache, and his position as a formidable opponent to all who have other purposes to serve than those of science and patriotism, is a quite sufficient answer to all this: let us turn to what, we will, by courtesy, call the *argument* of the pamphlet.

Reduced to propositions, it appears to be, that the Coast Survey is a very costly work; much more so under Mr. Bache, than it was under Mr. Hassler; that it employs a great number of persons; and that the Superintendent is at the same time a member of the Light House Board; a Regent of the Smithsonian Institute, and an influential member of the American Association for the Advancement of Science.

The inference which the anonymous author would willingly have his readers draw from all this is, that Mr. Bache abuses his influence for his own personal ends, or for the advancement of his friends, but as this is nowhere distinctly alleged, and especially as no specific cases of such action are brought forward, we may pass such inference by for the time; certain that when any attempt is made at such allegations and proofs, their utter falsity will be abundantly demonstrated, and perhaps a righteous lesson be taught to anonymous libellers.

The Coast Survey is undoubtedly an expensive work, and it was the duty of the Government before instituting it to satisfy itself that the benefits to be derived from it were commensurate with its probable expenditure; and it is the duty of Congress now, to be satisfied that every dollar which is appropriated to it, is necessary for the attainment of these benefits. That this has been the case heretofore, any reference to the Congressional documents and the debates, all of which, notwithstanding the implied statement of this pamphlet, are accessible to any one who desires to be informed on the subject, and especially to any one residing in a city or town where there is a public library of any importance, will show.

In one of his early reports, the present Superintendent submitted to the Government, two alternatives; the continuance of the survey on the scale which had been adopted up to that time; and its enlargement, and consequently an increased annual expense; and he pointed out, that the latter plan would, by hastening the completion of the work, and allowing it to be carried on at all seasons of the year, be the more economical in the end; besides fulfilling more perfectly, the practical purposes for which the Survey was originated and maintained.

The Secretary of the Treasury and the Committees of Congress, and all subsequent Secretaries and Congresses were convinced that he was right; the scale of the Survey was enlarged, and when it became important, if not absolutely necessary, to put our Pacific Coast also under survey, a large additional expenditure was at once and with great unanimity granted. There has probably never been a great policy in our country which has met more general approbation from statesmen of all parties, and of all sections of the country, than this. And the few exceptions, (and our pamphlet makes the most, of the only distinguished one, that

of Mr. Benton,) are easily understood by those who know the circumstances, and can hardly make an offset against the overwhelming favorable opinions. We infer from this, that inasmuch as, every year, the accounts of the Coast Survey have been submitted to examination, by able men of all the political parties, and of the most varied shades of personal opinions and influences, and since no charge has ever been heard of the smallest misapplication of the moneys, either from political or personal favoritism, we infer justly and inevitably, that each successive Congress, from the time that the present Superintendent took charge until the present, has been satisfied that the moneys appropriated have been honestly and judiciously applied to the purposes for which they were intended. But it is perfectly proper that every citizen of the United States should satisfy himself on the fundamental points of this matter; and, since the expenditures are necessarily heavy, answer for himself the questions; are the benefits derivable from the Survey such as to compensate for its expense? and can these benefits be secured with less outlay?

Now the chief motives which led Mr. Jefferson to propose, and have since led his successors to maintain the Coast Survey, are, as we take it, as follows:—

That we have an extensive sea-coast, and one of a very dangerous character: lying in such a position in reference to our commerce, as to make it a lee-shore for at least one-half of the prevailing winds; low, abounding with shoals, and subject to violent storms. Yet along this coast the whole of our internal commerce is compelled to pass, at all seasons of the year, and under every disadvantage: while, from the peculiar position of our principal ports, our foreign commerce is subjected to scarcely less danger. But commerce is one of the principal industries of our country, and one which it has always been the obvious policy of our Government to protect and encourage. An accurate survey, and abundant and good charts of this dangerous coast are therefore a national necessity; and the least inquiry will satisfy any dispassionate mind, that the actual pecuniary benefit of the Coast Survey, as represented by valuable cargoes saved, and a diminished rate of insurance rendered possible by its labors, would, in a single year, re-pay almost the whole outlay upon it since its commencement. And not only our merchants and the inhabitants of the coast, but every dweller in the land participates in this benefit, since such improvements present themselves to him in the diminished price of goods, and more easy communication with foreign countries.

Again, it is the interest of every industrious dweller in the land, that the capabilities, facilities, and difficulties of every port upon our coast should be thoroughly investigated and widely published, and this can be done only by accurate surveys made on the same plan, and all the appliances which an extensive operation can give.

And, finally, while we encourage emigration from abroad, and hold out inducements to millions of industrious men and their families to leave their own homes to give us strength and importance, it is a duty which we owe to the community of civilized nations, and one which is

enforced by all the considerations of humanity, to publish and diffuse as widely and rapidly as we can, accurate charts of the approaches of a coast which is known as one of the most dangerous in the world.

Indeed, so forcible are the pleas for the Coast Survey, that even our author does not directly attempt to undervalue its importance, but pleads only for the discharge of the present Superintendent, which action would doubtless answer all his purposes. But to this proposition there are some serious objections.

In the first place, the peculiar practical features of this Survey, those which give it its greatest value, to wit: the vast extent over which its examinations are extended at the same time, and the rapid publication of its results, are due entirely to Mr. Bache, and have never before been attempted in any similar survey. The late Mr. Hassler, who was an excellent and competent man, evidently regarded his survey rather in the light of a scientific problem, than as a work of practical importance to our country. Hence, his work was performed leisurely, and by a few parties; and hence, when he died in 1842, even his primary triangulation had not extended beyond Rhode Island on the East, and the shores of Delaware Bay on the South, and not a map had been published. In the fifteen years which have elapsed since then, under Mr. Bache's supervision, "the reconnoissance has been extended over 40,000 square miles; 8 primary and 41 secondary base lines have been measured; 30,000 square miles of primary triangulation have been executed; 15,000 miles of shore line surveyed by the plane table; the positions of 5000 points determined; 3,500,000 soundings made; 1400 manuscript maps executed. The record of triangulation fills 600 volumes; and of astronomical observations, 460 volumes; the record of computations, 800 volumes, and of tidal observations, 1200 volumes; 345 electrotype plates have been executed; 280 preliminary charts and sketches, and 52 finished maps published, and 90,000 copies of the same distributed."

This, it will be observed, is quoted from a report to which the author of our anonymous pamphlet, as well as any other inquirer, has access, and from this it appears that, while the average yearly expenses of Mr. Bache's survey, exceed those of Mr. Hassler in the ratio of 4 to 1, the amount of work done is greater in the ratio of 7·3 to 1, showing an economy of 27 per cent. in favor of the present method of conducting the survey.

Do not let us be understood in this comparison as underrating or reflecting on the labors of Mr. Hassler: he was an upright, laborious man, and an excellent Superintendent. Some of the work above enumerated was not possible in his day. But what we want to show is, that he has had a worthy successor: nor do we hesitate to affirm that if we should by any chance lose the services of Mr. Bache, it would be impossible to replace him in this country, (or, as we believe, in any other.) If Mr. Everett ever said, (and we want better evidence of it than our author's assertion,) "that the entire work is one of practical astronomy," he made a very great mistake. Besides a practical astronomer, it requires a physicist of high power, a surveyor, a mechanic,

and above all, a governor; one who can appreciate the work which his subordinates are doing—can applaud judiciously the merits, point out the defects, suggest remedies, counsel experiments, and inspire every one with zeal and energy to work.

Now let us look at the second question. Can these results be obtained with less expenditure? The only mode of judging of this, by the majority of men, must be by comparison with similar works executed in other countries, and we again refer to documents which are accessible to every one, for our data of comparison.

According to the pamphlet which we are examining, our Coast Survey cost, while under Mr. Hassler, from 1807 to 1842, \$730,900, and under Mr. Bache from 1843 to 1858, \$4,321,110; in all, \$5,052,010; and it appears that Mr. Bache employs 68 subordinates.

"The trigonometrical survey of Great Britain and Ireland was begun in 1791, and had cost, up to 1856, \$12,000,000; and it is estimated that \$8,000,000 will be required for its completion. The whole number employed on the survey in 1840, was 3500. The hydrographic surveys of England have cost, in the last twenty years, \$10,000,000; the average number of persons employed yearly in these surveys is 1500."

(It will be remembered that our Coast Survey includes the hydrography).

"The surveys of France have been in progress nearly 100 years. The length of the Coast of France is about 600 miles only, and its survey required 28 years for its completion. The cost of the hydrography of France, alone, since 1854, has been, \$4,300,000."

These examples of the two great commercial nations will probably suffice. It shows the comparative rapidity and economy of our survey, and the testimony of their scientific men, as well as of our own, will establish its accuracy.

We claim, therefore, to have vindicated the Coast Survey from the unfounded calumnies of the author of this anonymous tract. We have no time to allude to the Light House Board, &c., except merely to remark: That if the Government, exercised as it has been since Mr. Bache's residence at Washington, by all political parties, and by individuals who were bound to him by no ties of relationship, or personal friendship, have thought it expedient to use his talents and industry, in perfecting that portion of their administration where scientific knowledge is necessary, they have, we think, done well, and we hope they will continue to do so in future.

Whenever Mr. Bache is found guilty of perverting his position for political or personal purposes, he will sink nearer the level of anonymous writers, and their attacks may do him more harm.

To show the different estimate which foreign men of the highest character, and competent to judge of Mr. Bache's labor, put upon his work, we subjoin an extract from the address of Sir Roderick Impey Murchison, on presenting the Victoria Gold Medal to Mr. Bache. And when an English Society bears testimony to an American man of science in such terms as these, you may believe them. F.

"Operations of this nature will of course have been made available for a correct delineation of all the surface of the interior; for it is manifest that every triangle referable to a known unit furnishes three decided bases with which others may be connected in any direction, as long as there remains a *terra firma* for the instruments to stand on; but these internal operations, being more of a domestic nature, do not appear to the Council to establish any distinct claim to the medal. The case, however, is very different when we come to consider the accurate delineation of such a coast as that of the United States, commencing at the State of Maine, comprising no less than eighteen States on the Atlantic and Gulf of Mexico, besides others on the Pacific, and extending, as we are credibly informed, over not less than 30,000 miles. This number no doubt includes all the windings and indentations of the coast, and the interiors of its harbors, the islands, &c.; for it is to be remarked that, by the especial provision of the Government of America, the duty is not confined to one class of persons, but is shared equally by military and naval men and civilians, all chosen for their fitness; whereby not only is the field for selection vastly expanded, but a greater facility of correctly taking soundings and delineating shoals, harbors, and isolated rocks, is afforded.

"It would be impossible to do justice to an extensive work of this sort on an occasion like the present; but as the previous reports of this celebrated Coast Survey, from 1844 to 1845, inclusive, are in our library, those of our associates, and of the public generally, who wish to form an estimate of their value, can do so at their leisure, and they will see how vastly our medallist has pushed on this great work. *They will assuredly then rise from the examination with the thorough conviction that, whether we regard the science, skill, and zeal of the operators, the perfection of their instruments, the able manner in which the Superintendent has enlisted all modern improvements into his service, the care taken to have the observations accurately registered, his modest and unpretending demeanor, or the noble liberality of the Government, tempered with prudent economy. all unprejudiced persons must agree that the trigonometrical survey of the United States of America stands without a superior.*

"What, then, are we to say respecting the accurate delineation of this immense tract of coast, so much frequented by commerce, so important in every point of view to mankind at large, but that it is a great and universal boon conferred on all the inhabitants of this globe? We all benefit by the security of navigation: it is not the Government of the United States of America alone which derives an exclusive advantage from this admirable series of operations, but those who have most frequent access to the shores of the Atlantic and Pacific chiefly participate therein; and as Great Britain stands foremost amongst these, on whom can we so deservedly bestow one of our two royal gold medals this year?

"The grounds for making the award of the highest distinction which it is in our power to confer have been expressed in the terms sanctioned by the Council; but that document does not allude to other great qualities of a man who, besides his admirable Coast Survey, has so largely extended our knowledge on various subjects of scientific importance. I may here cite his delineation of the iso-magnetic curves both in Europe and America; his littoral and deep-sea soundings, which, it is believed, will soon enable us to read off the natural history of the Gulf Stream, and to calculate the periodicity and perturbations of the tides at given spots; and his many ingenious inventions, including a method of registering the pulsations of distant earthquakes."

The U. S. Naval Astronomical Expedition to the Southern Hemisphere, during the years 1849–1852.

At the suggestion of Lieut. J. M. Gilliss, L.L. D., and under the influence of strong recommendations from the American Philosophical Society, at Philadelphia, and the American Academy of Sciences, at Boston, Congress authorized the fitting out of an expedition to South America; the principal object of which was to test the value of a new method proposed by Prof. Gerling of Marburg, for determining the distance of the earth from the sun, which is the fundamental unit of all astronomical measures; but as to the value of which various serious doubts exist, owing to the fact that the determination rests upon

observations of a phenomenon (the transit of Venus,) very difficult to observe with the required accuracy, and happening but once or twice in a century. The discussion of the observations of 1761 and 1769, by Encke, led to a determination of 95,360,000 statute miles for the mean distance, and this has been generally accepted, for want of a better value. Very serious doubts have, however, always been entertained of its correctness, for many of the observations, and some of the most important of them, were unsatisfactory; and since no transit of Venus will again occur until 1874, and this, and those following for more than a century, will be unfavorable for the determinations wanted, Prof. Gerling proposed a mode to attain the same object by observations of the planet Venus, when nearest the earth, made simultaneously at two observatories, nearly on the same meridian, and as widely apart as possible in latitude. These observations, as we have said, the U. S. Government undertook to have made here, and at Santiago, in Chile; and excellent instruments were procured, the expedition organized, and Lieut. Gilliss, with three officers of the Navy, who volunteered, as his assistants, were sent out to make the observations.

As they proposed a prolonged stay in Chile, for the purpose of observing at two consecutive returns of Venus to inferior conjunction, it was, of course, intended to occupy the intervening time by observatoins astronomical, and others; especially in observing the planet Mars when nearest the earth, for the same purpose of determining the earth's distance from the sun (which had already been attempted, but with unsatisfactory results), and making a catalogue of the fixed stars of as large a portion as possible of the Southern Hemisphere.

The results of this expedition, which possess a very high scientific value both from their nature and the known competency of the superintendent, have been published by Congress in five well printed quarto volumes. The third of these contains the observations on Mars and Venus, with their discussion and reduction by Dr. B. A. Gould, Jr.

Unfortunately it has happened, how we cannot explain, that while so much pains and so much money was spent, and laudably spent, upon this expedition, the corresponding observations in the United States, which were essential to its success according to the method proposed, were almost entirely neglected; so that while we have from Chile an excellent set of observations upon 217 days, extending over nearly 3 years, we have to compare with them in all but 24 observations made in the United States, and 4 at Greenwich (England). And of these 28, but 8 were upon Venus, the planet especially selected as giving by far the best data for the problem; and these only corresponding to Lieut. Gilliss' first series; for his second series, to make which he remained so long abroad, not a single corresponding observation is to be found in the United States. How this has happened is not explained, yet nothing appears to require more candid explanation. Before the departure of the expedition, a circular was issued by Lieut. Maury, the Superintendent of the Washington Observatory, which is under the control of the same department of the government, under whose auspices Lieut. Gilliss was sent out, calling on all friends of astro-

nomical science in the United States to co-operate in promoting the objects of this important expedition. Yet, with a number of well furnished observatories in our country, we get nothing but this poor response, and the whole expedition is allowed to fail, for fail it did, in its main purpose. The method of Prof. Gerling remains untested; and although we have a new determination of the parallax, thanks to the consummate skill and industry of Dr. Gould, it rests on comparisons which are not sufficient to give it authority against the previous determination of Encke, from which it differs by a material amount.

Of course, if the independent observatories did not choose to enter into this scheme, nothing farther can be said. We may regret their want of national spirit, and see plainly that they are not governed by scientific aspirations, but farther we have no right to go. But the government who fitted out this expedition, have two observatories, one at Washington, under the control of the Navy Department, and one at West Point, attached to the Department of War. What were they doing? Was Venus visible but five nights during the period for corresponding observations? or did other still more important duties (we cannot imagine such,) prevent them from doing their share? If this be so, why is not the explanation made in the report, that the reproach which now rests upon us may be taken away? One or two additional observers, if necessary, might and ought to have been placed at each competent observatory in the United States, that the pompous language of the report in Congress about our "American contributions to science," might have been sustained. As it is, we occupy a worse position than if we had never undertaken the expedition.

Great credit, however, is due and should be given to those who were actively engaged in this matter, and especially to Lieut. Gilliss, for his zeal in its inception and carrying out, and his skill in observing, which becomes evident from the discussion of the observations. To Mr. Gould, who, for the ability and labor displayed in doing the best he could with his materials, the thanks of scientific men are due. It will be hard, indeed, if his capabilities as an astronomer are doubted when he has such a demonstration of them to produce.

His result is, that "the sun's equatorial horizontal parallax" (at his mean distance from the earth), is 8·5″, being less by 0·07″ than the value commonly adopted, and corresponding to a distance of 96,160,000 statute miles from the earth. F.

The Mathematical Monthly. Edited by J. D. Runkle, A. M., Cambridge. John Bartlett.

Such is the unpretending title of a new Journal devoted to science, of which the first three members have reached us. Its objects as declared in the introductory note, and in the prospectus which announced the intention of establishing it, are the advancement of science and the elevation of the standard of mathematical learning in this country. It proposes to accomplish these, by the proposal of problems suited to all

grades of students in mathematics, from the beginner, who feels for the first time the desire to exercise his newly acquired sense, to the veteran, who wishes to test his own mature powers, or try the strength of his competitors by a friendly challenge, or to communicate to the world the results of his studies; and by the publication of "all scraps of mathematical writing too good to be lost, whether elementary or profound, whether original in manner or matter, whether complete in themselves, or to be resumed at the convenience of the author;" as well as of "carefully elaborated essays." In addition, the editor submits this proposal, which, if it meet with the attention which it deserves, will be of vast importance to the progress of science amongst us. "All mathematicians know that there are many subjects in the higher departments of the sciences upon which, little, if any thing, has as yet been written among us. Now, if they will take these subjects and develop them fully and systematically through the pages of the Journal, they may afterward be issued in a separate form from the stereotype plates, at a very small cost. In such cases, the right and benefit thereof shall vest in the author."

It requires no argument to show that a periodical conducted in accordance with these views, is much wanted in this country, and that, if ably supported, will be of the greatest benefit to our science. As to the ability with which it is likely to be conducted, the character of the editor, and the list of names of those who have promised their active support, including, as it does, those of our most eminent men in this branch of science, and of almost all of them, is more than a sufficient guarantee.

To those whose experience has taught them to rely less on things promised than on those performed, an examination of the three numbers already published must prove satisfactory.

They have already given us a number of ingenious and useful suggestions of problems suited to various degrees of mathematical ability; but the gem of the collection, is an account of the late great comet, (1858, V. Donati,) as it appeared in the great Equatorial Telescope at Cambridge, contributed by G. P. Rand. The value of this paper as a contribution to our knowledge of the nature of comets cannot well be overrated, and, although in no wise mathematical in its form, it is worth close investigation by the mathematician as giving requisite data for his researches.

The appearance of this Journal is in all respects worthy of its other high merits. The form is convenient, the type excellent, the page handsome, and the plates illustrating the appearance of the comet, worthy of high praise for their artistic excellence.

Let every one who reads our notice take pains to satisfy themselves that we are not exaggerating the praise deserved.

We hope that the enterprise may prove successful. It is highly honorable to Mr. Runkle to have attempted this thing, it will be discreditable to our country if it does not succeed. Should its success equal its merits, both the editor and the country will have cause to congratulate themselves. F.

Abstract of Meteorological Observations for October, 1858; made in Philadelphia, Somerset, Bedford, and Huntingdon Counties, Pennsylvania, for the Committee on Meteorology of the Franklin Institute.

PHILADELPHIA.—Lat. 39° 57′ 28″ N. Long. 75° 10′ 28″ W. Height above the sea 50 feet. Prof. J. A. KIRKPATRICK, Observer.

October, 1858.	Barometer. Mean.	Barometer. Mean daily range.	Thermometer. Mean.	Thermometer. Daily oscillation.	Thermometer. Mean daily range.	Relative humidity. 2 P.M.	Force of vapor. 2 P.M.	Rain.	Prevail'g winds.
	Inch.	Inch.	°	°	°	Per ct.	Inch.	Inches.	
1	29·617	·135	65·3	20	8·0	75	·572	0·025	(var.)
2	29·850	·234	60·0	20	5·3	36	·262		WNW
3	29·682	·168	69·3	30½	9·3	47	·486		S W.
4	29·590	·092	77·3	25	8·0	33	·462		WSW.
5	29·875	·285	65·7	13	11·7	34	·265		N W.
● 6	29·967	·119	60·7	16½	5·0	37	·244		(var.)
7	29·487	·481	64·5	12	3·8	89	·591	0·257	S W.
8	29·565	·141	52·0	21¼	12·5	24	·126	0·030	W.
9	29·698	·134	52·7	20	2·0	35	·189		S W.
10	29·992	·294	56·0	21½	3·3	40	·258		W.
11	29 994	·028	56·8	12	4·8	54	·282		(var.)
12	29·966	·054	58·7	13	1·8	57	·327	0·277	N E.
13	29·764	·202	64·8	12	6·2	84	·577	0·238	S W.
☾ 14	29·771	·068	58·3	14	6·5	46	·255		S W.
15	30·034	·263	55·2	19	4 2	38	·228		W.
16	30·221	·187	58·7	25¼	3·5	40	·292		(var.)
17	30·290	·069	62·0	23	3·3	46	·376		S W.
18	30·256	·038	60·0	22	2·0	61	·448		S W.
19	30 113	·143	62·3	20½	2·3	58	·455		S W.
20	30·003	·110	63·5	25	3·2	56	·483		S W.
21	29·997	·072	60 2	16½	7·0	73	·451		N E.
○ 22	29·927	·117	57·3	6	3·5	88	·422	0·066	N E.
23	29 769	·158	62·3	14	5 0	83	·516		N E.
24	29·772	·068	56·7	18	5·7	50	·291	0·012	(var.)
25	29·989	·216	49 5	17	7·2	26	·127		N.
26	30·081	·109	46 3	19	4·2	32	·133		N N E.
27	30·053	·045	50·8	27	4·5	32	·175		N E.
28	30·086	·034	55·0	35	4·2	31	·202		N.
☽ 29	30·041	·057	56 5	10	6·8	88	·422	0·699	N E.
30	29·790	·251	63·5	10	7·0	89	·569	0·174	S.
31	29·846	·076	62·3	17	3·2	56	·397	.. –	S W.
Means	29·906	·143	59·5	17	5·3	53	·351	1·778	s 84¾ w

SOMERSET, Somerset Co. Lat. 40° N., Lon. 79° 3′ W. Height 2195 feet. GEO. MOWRY, Observer.

BEDFORD, Bedford Co. SAMUEL BROWN, Observer.

HUNTINGDON, Huntingdon County. JACOB MILLER, Obsr.

October, 1858.	Somerset Bar. Mean.	Somerset Ther. Mean.	Somerset Relative humidity. 2 P.M.	Somerset Force of vapor. 2 P.M.	Somerset Rain.	Somerset Prevail'g winds	Bedford Bar. Mean	Bedford Ther. Mean.	Bedford Prevail'g winds.	Huntingdon Bar. Mean.	Huntingdon Ther. Mean.	Huntingdon Rain.	Huntingdon Prevail'g winds.
	Inch.	°	Per ct.	Inch.	Inch.		Inch.	°		Inch.	°	Inch.	
1	27·538	55·7	91	·429	0·316	WNW	28·937	62·3	N W.	29·103	61·7	0·249	N W.
2	27·708	54·3	51	·348		W.	29·166	56·7	N W.	29·318	53·7		N.
3	27·535	70·0	54	·536		WSW.				29·088	66·3		W.
4	27·502	71·3	50	·499	0·098	W.	28·873	76·0	S W.	29·048	77·0	0·080	W.
5	27·730	57·0	62	·355		(var.)	29·173	58·7	N W.	29·381	59·7		N.
● 6	27·726	54·0	79	·386		(var.)	29·218	55·7	S E.	29 398	56·7	0·376	S.
7	27·369	58·7	59	393	0·453	W.	28·785	63 0	(var.)	28·938	61·7	0·060	W.
8	27·410	43·3	59	·220		W.	28·845	50.7	N W.				W.
9	27·583	42·7	69	·214		W.	29·029	47·0	N W.	29·284	49·7	0 062	N.
10	27·808	46·7	64	·308		N W.				29·501	48·3		N.
11	27·753	52·7	48	·300		S S E.	29·214	57 7	S W.	29·422	55·7	0·104	(var.)
12	27·681	54·7	82	·426	0·250	S E.	29·157	52 0	S E.	29·361	54·3	0·432	S E.
13	27·604	54·3	82	·442		WSW.	29·039	59·7	S W.	29·192	57·7		S.
☾ 14	27·646	46·0	51	·201		W.	29·100	53·0	N W.	29·264	55·0		W.
15	27·853	48·7	54	268	0·032	W.	29·310	51·3	N W.	29·539	49 3		W.
16	27·999	54·0	41	·326		WSW.	29·470	54·7	S W.	29·680	50·7		W.
17	28·064	58·7	53	·455		S W.				29·700	55·3		S.
18	28·039	59 3	52	·469		S.	29·472	58·7	S W.	29·663	55·3		S.
19	27·896	59·0	50	·408		S.	29·341	60·3	N W.	29·549	56·3		S.
20	27·785	62·0	62	·488		S.	29 243	59·7	(var.)	29·420	58·7		S.
21	27·799	62·0	57	·435		(var.)	29·246	63·3	S E.	29·435	61·7		S.
○ 22	27·745	58·7	65	·462		W.	29·183	57·0	S.	29·368	59·7		S E.
23	27·690	50·3	57	·327		N W.	29·115	58·0	N W.	29·294	56·7		N.
24	27·711	46·3	70	·287		(var.)				29·384	52·0		N.
25	27·799	46·0	73	·295		(var.)	29·243	47·0	N W.				(var.)
26	27·816	44·0	47	·183		S S E.	29·323	44·3	N W.	29·544	40·0		S E.
27	27·835	43·3	49	·205		S E	29·333	42.0	E.	29 561	38·7		S E.
28	27·843	47·0	64	·262	} 0·609	S.	29·334	47·3	S E.	29·553	45·0	0·338	S E.
☽ 29	27·727	48·7	86	·322		S E.	29·237	51·3	S E.	29·416	50·7	0·259	S.
30	27·630	53·0	77	·412	0·008	WSW.	29·064	56·3	N W.	29·225	54·7		S.
31	27.698	49·0	64	·308	0·290	WSW.				29·380	51·7		N.
Means	27·725	53·4	62	·354	2·056		29·171	55·5		29·393	56·9	1·960	

JOURNAL

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FOR THE

PROMOTION OF THE MECHANIC ARTS.

FEBRUARY, 1859.

CIVIL ENGINEERING.

*Canals and Canal Conveyance.** By W. O'Brien, C. E.

[Extracts from the Prize Essay on Canals and Canal Conveyance for which a premium of £100 was awarded by the Canal Association.]

(Continued from page 26.)

It has often been argued that large and deep canals offer more resistance than those with a small sectional area. Granting this to be true (and in our present state of knowledge of hydraulics the fact has to be verified), we find that this argument in favor of maintaining the old dimensions loses much of its importance when we consider that all canals are frequented by boats drawing various depths of water: now, on the other hand, the power of increasing at any time the size and draft of water of boats is of great importance. Then as to steam towing in particular, every one knows that steam engines cost less per H. P. the larger they are, and that no more men are required to work a 200 tons steamer than to work one of 100 tons. Besides, steamers traveling much faster than boats tracked by horses, would probably require a little more room for crossing each other without stopping the engines.

The widening of the pounds is not of so much importance as that of the locks, because the former can be done gradually and according to the wants of navigation (where traffic is not very brisk the width should be calculated for a single boat with occasional sidings), whereas, the latter is an expense which cannot be divided. To be accessible to trains

* From the Lond. Civ. Eng. and Arch. Journal, Oct., 1858.]

of boats, as on the Severn navigation, they should have the length of the longest train, and at least three pairs of gates, more if water is scarce, so as never to draw from the upper pounds more water than that strictly sufficient for navigation. It is needless to say, then, it takes no more water to pass two or more boats at a time than separately.

Supposing it to be granted that a wider sectional area and enlargement of locks are necessary, it becomes evident that the supply of water must be considerably increased, or else means must be found for diminishing the expenditure, principally that due to lockage.

The first object can be attained, 1st, by deepening the cuttings at the summit levels; 2d, by increasing the dimensions of reservoirs; 3d, by artesian borings (Kind's system is the best) properly and carefully applied; 4th, when these means fail to bring water to the requisite height in sufficient quantity, recourse must be had to machinery: the Cornish engine must be applied,—it is in most cases the best.

The second object, that of diminishing the expenditure of water, can only be attained by two means: either suppressing locks altogether, and having recourse to machinery for raising or lowering boats from one level to another; or by restoring to each lock the quantity taken out of it for the passage of each boat.

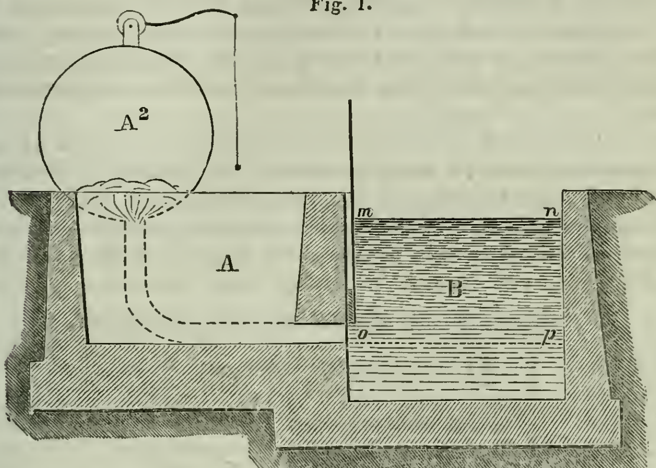
Inclined planes require machinery of the most expensive description, and can never work cheaply, because the machinery has to develop great efforts at a given time. Generally, engines used intermittently give a bad result, because a great deal of steam is wasted, and because they must be made on large dimensions. When the same work can be done gradually, a smaller engine answers the purpose. This is probably one of the reasons why locks have been maintained in preference to inclined planes, even in cases where it has been found necessary to raise water for lockage at a height varying from 50 to 70 ft., as in the case of the Ering summit level. If I were to advocate any mechanical mode of raising boats from one level to another, I would suggest the hydraulic press.

If a reservoir A, or a second lock, be made next to the one in use, B, Fig. 1, with a sluice at S, to open or shut off its communication with B, it will enable one to save half a lockfull; for supposing mn and op to be the level of the water in the upper and lower pound, if we want a boat, say to go down, we shall open the sluice at S and turn out the water remaining in the lock into the lower pound; we shall thus have half a lockfull ready for an ascending boat.

I now come to a recent invention of a French engineer, M. Andraud, for restoring the water momentarily abstracted from the lock for the passage of each boat. With M. Andraud's invention, we save the entire lockfull, instead of half, as in the preceding case; for reservoir A^2, instead of being open, is shut in and air-tight, and communicates with an air-pump, which rarefies the air in A^2 till all the prism of water in $mnop$ is introduced into A^2. To the air-pump may be substituted a small coal fire; I believe it is this system which was originally proposed by the inventor. This seems a really practical invention.

An important object of consideration is the loss of time in passing from one lock to another. Wherever the supply of water is sufficient, let locks be made as deep as possible, so as to reduce to a minimum the number of locks necessary for a given total fall. I see no reason

Fig. 1.



for giving the lower locks the same dimensions as the upper ones; let them be larger if they can easily be supplied with water. Signals should be used to warn the lockmen at the approach of boats; double locks should be preferred, although they cost more; the openings for admitting water should be larger.

If it is allowed that a large sectional area is necessary, then it is evident that too much importance cannot be given to river navigation. I much doubt whether it was a right step to establish several miles of canal parallel to rivers—as the Kennet and Avon Canal parallel to the Kennet, the Rhone au Rhin Canal parallel to two rivers (the Rhine and the Ill), &c.—instead of improving the bed of the rivers themselves, and simply shortening the distances by cuts avoiding the bends. It will be urged that the establishment of locks and weirs in some rivers would be very difficult; then let our endeavors, by all means, be directed towards improving this branch of hydraulic engineering.

There is no doubt that foundations in a large river, with strong current, are very expensive, but this part of the engineer's art has much improved since Brindley and Brisson. Persons interested in this branch of construction would do well to read the accounts of the Chester and Rochester bridges, the French and German works on the process known as "foundation sur encaissement."

It will be asked, what would be the expense of widening our canals, and applying some of the alterations proposed? That is impossible to say; but the alterations can be made gradually, and we can assign a limit to the expenditure. We can expend as much on the establishment of a canal line as is spent on the nearest parallel railway, and have nothing to fear from the latter; as the cost of conveyance, exclusive of general expense, is less on the canal than on the railway.

The object of canal or boat proprietors should not be to adapt the form and dimensions of boats to those of canals, or *vice versâ*, but rather to adapt both to a direct communication with rivers, harbors, and estuaries, in such a manner as to suppress, or at least to reduce to a minimum, all transfer of goods, avoiding thereby destruction of property, expense of loading and unloading, wharfage, agency, and loss of time. This object cannot be attained by the canal owners alone, but needs the co-operation of the inland and maritime conveyance companies.

The table annexed reduces to three types all the systems of machinery at present in use on screw steamers. M. Inshaw, of Birmingham, has built, for the Grand and Regent's canal, boats with two screws astern, one on each side of the rudder, revolving in opposite directions, and worked simultaneously by the same engine; these boats are said to be very good and to steer well when going stern on.

Different Systems of Steam Engines and Propellers.

One or two screws revolving rapidly and finely pitched.	High-pressure non-condensing locomotive engines, acting directly on the main shaft, two or four cylinders; cranks acting at right angles; lap and lead of slide valves; no special apparatus for expansion; tubular boilers and steam jet; pressure of steam as high as possible.	Very suitable for small boats.	If two screws are applied they should work in opposite directions, and the engines should be so disposed as to be easily disconnected in case of accident to one of the screws.	The hand gear, pressure gauge, &c., to be on deck; the boilers to be fed by a separate engine or donkey.
	Low-pressure condensing engines with expansion gear, multiplying beveled gear; air-pump worked by a crank or main shaft. Not necessary to have more than one cylinder.	A sudden jerk may break the beveled wheels, and thereby render the engines useless		
One or two screws with a coarse pitch revolving slowly.	Low-pressure condensing engines work'g directly on the main shaft; air-pump worked by a separate (?) engine; special apparatus for expansion: two or four cylinders with cranks acting at right angles.	. . . . . .		
Two paddles astern or in the middle.	Same as preceding; but the air-pump can be worked by a crank on the main shaft.	Not advocated		

As to ship canals, the mere inspection of a map will at once give an idea of the localities most favorable to works of such magnitude. Might not a line be found favorable for a direct ship navigation from Galway or Limerick to the German Ocean, thus avoiding the Channel? The Forth and Clyde estuaries have already been suggested by Mr. Macpharlane; a line from Newcastle to Carlisle, or from Hull to Liverpool, is perhaps feasible: it is proposed to make one from Southampton to the Thames. Ship canals are more frequently supplied from the sea itself; in that case the total fall is limited by the height of the spring tides.

In a description of boat which I propose for river and canal navigation, owing to the peculiar shape of the cross section, fine lines can be obtained underneath without much loss of space. The deck is scarcely tapered at the end, so as to give room for loading and unloading.

In the ordinary boat with two screws, the engine acts on the screw shafts by means of beveled gear, so that if the latter breaks down, which is a frequent occurrence, the engine is of no use. I propose that the engines work directly on the screw shafts, a strap connecting the two screws, but only to ensure regularity of working; if it breaks, the only effect will be that the engines will work separately.

Experience alone can show the best dimensions of boats and locks. If 90 feet by 15 feet were found to answer, it would save the necessity of rebuilding on larger dimensions a vast number of our locks; still when a lock is much out of repair, I would advise rebuilding on larger dimensions.

With such powerful means of conveyance as those afforded by railways on one hand, and coasting vessels—screw vessels in particular—on the other, we should be wrong in laying out large sums of money to maintain certain lines of navigation which do not present certain natural resources, and which do not allow, from the unfavorable circumstances in which they are placed, of conveying large quantities in a given time. I am convinced that the future prospects of inland navigation lie in improvement of our rivers, widening of our canals, and application of steam power to towing trains of boats. Except in a few rare cases, we cannot afford to maintain narrow canals; if it be too expensive to widen them, let them be turned to account as feeders to the wide canals, or for water works or agriculture; and the wide canals should be in immediate connexion with our seaports and docks.

This was written before I met with the following passage in one of the most remarkable works ever written, Flachat's "Projet de Canal Maratime de Paris au Havre:"

"Goods can be conveyed by sea more economically than by inland navigation. . . It follows, that even at greater distances seaports enjoy more means of exchange of produce between each other than towns in the interior, since they can communicate at less expense. . . Thus it is that the greatest commercial activity prevails in seaports, for trade extends according to the means of communication. Therefore it is evident that for the greatest good of the country, seaports

should enjoy the most ample means possible of putting the interior in possession of those commodities which can so easily be exchanged from one seaport to another. We can therefore establish as a principle, that a proper system of navigation ought to converge from the interior to the principal ports of the sea coast, and that it is easy to foresee that the most important lines of navigation will be those which join the most flourishing seaports to the towns where the manufactures are the most important or the consumption greatest."

Concluding Remarks.

The best way of proceeding with works is, first, to draw up a list of prices, and pay the builders according to valuation. The advantages are, that better workmanship and better materials are obtained; the builders can content themselves with a moderate profit, because they run no risks; when the works give dissatisfaction they can be stopped, and agreements made with other parties; and the owners are free to change their plans at any time;—or, secondly, combine the two systems, contract for that which is certain, a schedule of prices for what is uncertain.

The question of working expenses is more important in the present position of our canals. A canal may be worked in three different manners: it may be left open to all boats on payment of a toll; or the owners may find boats, steamers, horses, &c., and work them or a part of them at their own cost and risk; or they may make an agreement with a contractor for all or part of the traffic of the line.

The first system cannot very well be applied exclusively, at least by private individuals or companies; such a source of income would fluctuate too much in a great many cases. (When the owners are equally interested in the canal as a property, and in the traffic as a source of income, the canal is worked with more advantage, and the boats and canal are better adapted to each other, than when the interests are entirely separate.) The contract system may be applied here with advantage.

Supposing some of the improvements I have suggested to be carried out, it becomes a question how and where they are to be applied. A general increase of expenditure along a canal would perhaps be rather hazardous. I propose widening and improving our canals,

1st, In localities where a considerable traffic exists or may be expected, and in particular on lines perpendicular rather than parallel to railways.

2d, In the vicinity of harbors, docks, and navigable rivers, effecting as easy a communication with and between them as possible.

3d, Enlarging the pounds only where it can be done at a moderate expense, in other places leaving only room at present for the passage of boats one way, with occasional sidings, till an increase of traffic justifies further expenses.

4th, Rebuilding locks on larger dimensions only when they get out of repair.

5th, Buying property for extensions as soon as possible, particularly

where it can be done without compulsion, but without extending the works till the wants of an increased conveyance make it necessary. In the meanwhile the ground may be let, or otherwise made available.

Inland Navigation on the Continent.

France.—Notwithstanding the numerous railways which are fast spreading over the country, and the handsome and commodious vessels which ply between the seaports on the coast of France (vessels built on eminently scientific principles, costing from 200 to 500 francs per ton, and conveying freights at very low rates), the traffic on canals and navigable rivers in France has been continually gaining in importance.

Competition seems to have excited the ingenuity of the engineers, as will be seen by some of the following innovations:

Verpilieux's paddle-boats are adapted to stemming the Rhone and other strong currents. The paddles are armed at the periphery with strong iron claws, like the flukes of an anchor, and can be raised or lowered without ceasing to be propelled by the engines. When raised they act in the ordinary manner; when lowered the claws strike the bottom, and a resisting fulcrum being obtained, the most rapid current may be stemmed.

The hydraulic car may be compared to an ordinary locomotive, with this exception, that the driving wheels are propelled by water-power instead of steam, the permanent way being composed of a railway and canal together. It may be useful in turning torrents to account for the conveyance of minerals or timber.

The "barrages mobiles" are simply movable weirs of a more or less ingenious construction. They serve to regulate the regime of a river, and to afford a downward passage to rafts of wood; the passing of such a place is not always void of danger. A description of M. Poirée's barrages ought to be read.

The "bateau Toneur" used on the lower Seine and the Oise is moved by means of a revolving drum on which passes a chain extending all along the bottom. It is used as a tug boat.

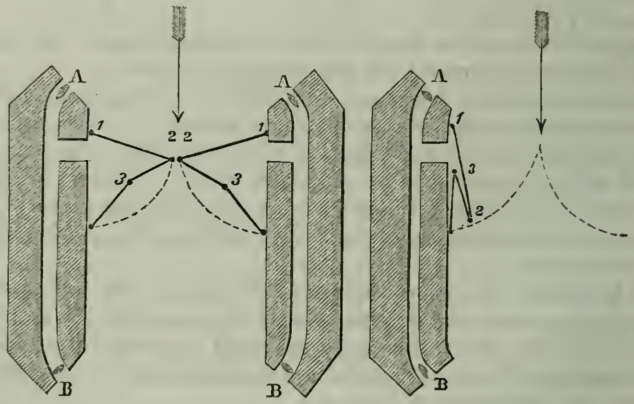
Fourneyron's sluice and lock-gate is an ingenious and completely practical invention which that eminent hydraulic engineer proposed some years ago for the weir and lock at the "Monnaie," Paris. Each gate is articulated at 1, 2, 3, (Fig. 2.) A conduit passes through the side wall, and connects the water above, below, and behind the gate. If A be opened and B closed, the water from the upper level fills the conduit, finds its own level behind the gate, and pressing on the panels 1, 2, and 2, 3, closes the gate. If we want to open the gate, we shall close A and open B; the water will run out into the lower level; the pressure above the gate will then be less than the pressure behind it, and it will collapse against the side wall as in Fig. 3. The two sluices A, B, are worked by the same lever, and are made to turn on a pivot, so that scarcely any effort is necessary to open or shut them. This invention has been found by repeated experimemts to be per-

fectly applicable to rivers and canals, whatever may be the difference of level.

Several descriptions of iron steamers, but all of a superior make, now run from Paris to Rouen, Havre, and London. They load and unload in Paris, at the "Cassin de la Vilette," passing by the canal St. Denis. They carry from 150 to 250 tons of freight, and have engines and propellers astern. The propellers are two paddles, one on each side of the stern-post, or one screw before the rudder, or two screws revolving in opposite directions. The Express boats are fine sea-going vessels, with two screws, and taffrail before the funnel. The

Fig. 2.

Fig. 3.



"Paris et Londres" are auxiliary screw schooners, conveying cargo in one bottom from Paris to London in five days, including stoppages at Rouen and Havre. Most of these vessels are propelled by condensing engines. Steamers ply on most of the French canals, but steam haulage is seldom applied except on rivers.

Sweden.—The following is communicated to me by a friend, H. Parish, Esq., of New York:

"My opinion is that the application of steam to canal navigation has been more successfully carried out in Sweden than elsewhere; the steamers are all screw steamers, and travel at the rate of 9 to 10 miles an hour, excepting where the canal is narrow, and they are obliged to go at half speed to avoid washing the banks; the engines are small and compact; the cylinders are inclined, and rest upon a hollow bed-plate, which is the condenser; the air-pump and feed-pump are worked either by eccentrics on the main shaft, or directly from the cross head of the piston rod. The hand gear is on deck. This engine is almost universal in Sweden, and is well known, having obtained a medal at the French Great Exhibition. The vessels convey from 150 to 200 tons freight, and could tow several barges."

*On the Measurement of Water by Weir Boards.**

The following report, by JAMES THOMSON, A. M., C. E., Professor of Civil Engineering, Queen's College, Belfast, on the progress of experiments on this subject, was read before the Mechanical Section:—

The experiments proposed to be comprehended in the investigations to which the present interim report of progress relates, have for their object to determine the suitableness of triangular (or V-shaped) notches in vertical plates for the gauging of running water, instead of the rectangular notches in ordinary use. The ordinary rectangular notches, accurately experimented on as they have been, at great cost and with high scientific skill in various countries, with the view of determining the necessary formulas and coefficients for their application in practice, are, for many purposes, suitable and convenient. They are, however, but ill adapted for the measurement of very variable quantities of water, such as commonly occur to the engineer to be gauged in rivers and streams. If the rectangular notch is to be made wide enough to allow the water to pass in flood times, it must be so wide that for long periods, in moderately dry weather, the water flows so shallow over its crest, that its indications cannot be relied on. To remove in some degree this objection, gauges for rivers or streams are sometimes formed, in the best engineering practice, with a small rectangular notch cut down below the general level of the crest of a large rectangular notch. If, now, instead of one depression being made, for dry weather use, in a crest wide enough for use in floods, we conceive of a large number of depressions, extending so as to give to the crest the appearance of a set of steps or stairs, and if we conceive the number of such steps to become infinitely great, we are led at once to the conception of the triangular instead of the rectangular notch. The principle of the triangular notch being thus arrived at, it becomes evident that there is no necessity for having one side of the notch vertical, and the other slanting; but that, as may, in many cases, prove more convenient, both sides may be slanting, and their slopes may be alike. It is then to be observed that, by the use of the triangular notch, with proper formulas and coefficients, derivable by due union of theory and experiments, quantities of running water from the smallest to the greatest, may be accurately gauged by their flow through the same notch. The reason of this is obvious from considering that, in the triangular notch, when the quantity flowing is very small, the flow is confined to a small space admitting of accurate measurement; and that the space for the flow of the water increases as the quantity to be measured increases, but still continues such as to admit of accurate measurement.

Farther, the ordinary rectangular notch, when applied for the gauging of rivers, is subject to a serious objection from the difficulty or impossibility of properly taking into account the influence of the bottom of the river on the flow of the water to the notch. If it were practicable to dam up the river so deep that the water would flow through

* From the Journal of the Society of Arts, No 311.

the notch as if coming from a reservoir of still water, the difficulty would not arise. This, however, can seldom be done in practice; and, although the bottom of the river may be so far below the crest as to produce but little effect on the flow of the water when the quantity flowing is small, yet when the quantity becomes great, the "velocity of approach" comes to have a very material influence on the flow of the water, but an influence which it is usually difficult, if not impracticable, to ascertain with satisfactory accuracy. In the notches now proposed, of triangular form, the influence of the bottom may be rendered definite, and such as to affect alike (or, at least, by some law that may be readily determined by experiment) the flow of the water when very small, or when very great, in the same notch. The method by which I propose that this may be effected, consists in carrying out a floor, starting exactly from the vertex of the notch, and extending both up-stream and laterally, so as to form a bottom to the channel of approach, which will both be smooth and will serve as the lower bounding surface of a passage of approach, unchanging in form, while increasing in magnitude at the places, at least, which are adjacent to the vertex of the notch. The floor may either be perfectly level, or may consist of two planes, whose intersection would start from the vertex of the notch, and, as seen in plan, would pass up stream perpendicularly to the direction of the weir board; the two planes slanting upwards from their intersection more gently than the sides of the notch. The level floor, although theoretically not quite so perfect as the floor of two planes, would probably, for most practical purposes, prove the more convenient arrangement.

With reference to the use of the floor, it may be said, in short, that by a due arrangement of the notch and the floor, a discharge orifice and channel of approach may be produced, of which (the upper surface of the water being considered as the top of the channel and orifice,) the form will be unchanged, or but little changed with variations of the quantity flowing; very much less, certainly, than is the case with rectangular notches. The laws regulating the quantities of water flowing in such orifices as have now been described, come naturally next to be considered. Without, however, in the present interim report, attempting to enter on a detailed discussion of theoretical considerations on this subject, I shall here merely advert briefly to the principal results and methods of reasoning.

By theory I have been led to anticipate that the quantity flowing in a given notch should be proportional or very nearly so, to the $\frac{5}{2}$ power of the lineal dimensions of the cross section of the issuing jet, or to the $\frac{5}{2}$ power of the head of water over the vortex of the notch. This head is to be understood, in the case of water flowing from a still reservoir, as being measured vertically from the level water surface in the reservoir down to the vertex of the notch; or in the case of water flowing to the notch with a considerable velocity of approach over a floor arranged as above described, the head is to be considered as measured vertically from the water surface, where the motion is nearly stopped by the weir board at a place near the board, but as far as may be found

practicable, from the centre of the notch. The law here enunciated, to the effect that the quantity flowing should be proportional to the $\frac{5}{2}$ power of the head, I consider should hold good rigidly in reference to water flowing by a triangular notch in a thin vertical plate, from a large and deep reservoir of still water, if the water were a perfect fluid, free from viscidity and friction, and from capillary attraction at its surface, and from any other slight disturbing causes that may have minute influence on the flow, the flow being supposed to be that due simply to gravitation resisted by the inertia of the fluid. The like may be said of water flowing from triangular notches with shallow channels of approach, having floors as described above, when due attention is given to make the passages of approach so as really to remain unchanged in form for a sufficient distance from the notch, while increasing in magnitude as the flow increases (such being supposed according to my theory to be possible), and if due attention be paid to the measuring the heads in all cases in positions similarly situated with reference to the varying dimensions of the issuing streams.

In illustration of these statements, or suppositions, I would merely say, that, if two triangular notches, similar in form, have water flowing in them at different depths, but with similar passages of approach, the cross section of the two jets at the notches may be similarly divided into the same number of elements of area; and that the areas of the corresponding elements will be proportional to the squares of the lineal dimensions of the cross sections ; or, as from various considerations may readily be assumed proportional to the squares of the heads; also the velocities of the water in the corresponding elements may be taken as proportional to the square roots of the lineal dimensions, or to the square roots of the heads. From these considerations, supported by numerous others, it appears that the quantities flowing should be proportional to the products of the squares of the heads into their square roots, or to the $\frac{5}{2}$ power as already stated.

The friction of the fluid on the solid bounding surfaces of the passages of approach, where the water moves rapidly adjacent to the notch, may readily be assumed from all previous experience in similar subjects, not to have a very important influence even on the absolute amount of the flow of the water; and if we assume (as is known to be nearly the case for high velocities, such as occur in notches used for practical purposes, unless usually small) that the tangential force of friction of the fluid per unit of area of surface flowed along, is proportional to the square of the velocity of flow, it follows by theory that the friction, though slightly influencing the absolute amount of the flow, will not, according to that assumption, at all interfere with its proportionality to the $\frac{5}{2}$ power of the head. And this condition will very nearly hold good if the assumption is very nearly correct.

How closely the theory thus briefly sketched may be found to agree with the actual flow of water, will be a subject for experimental investigation; and whatever may be the result in this respect, the main object must be to obtain for a moderate number of triangular notches of different forms, and both with and without floors at the passage of

approach, the necessary coefficients for the various forms of notches and approaches selected, and for various depths in any one of them, so as to allow of water being gauged for practical purposes when in future convenient, by means of similarly formed notches and approaches. The utility of the proposed system of gauging, it is to be particularly observed, will not depend on a perfectly close agreement of the theory described with the experiments; because a table of experimental coefficients for various depths, or an empirical formula slightly modified from the theoretical one, will serve all purposes.

To one evident simplification in the proposed system of gauging, as compared with that by rectangular notches, I would here advert, namely, that in the proposed system the quantity flowing comes to be a function of only one variable, namely, the measured head of water, while in the rectangular notches it is a function of at least two variables, namely, the head of water and the horizontal width of the notch, and is commonly, also, a function of a third variable very difficult to be taken into account, namely, the depth from the crest of the notch down to the bottom of the channel of approach; which depth must vary in its influence with all the varying ratios between it and the other two quantities of which the flow is a function.

The proposed system of gauging also gives facilities for taking another element into account, which often arises in practice, namely, the influence of back water on the flow of the water in the gauge, when, as frequently occurs in rivers, it is found impracticable to dam the river up sufficiently to give it a clear overfall free from the back or tail water. For any given ratio of the height of the tail water above the vertex of the notch, I would anticipate that the quantities flowing would still be, approximately at least, proportional to the $\frac{5}{2}$ power of the head as before, and a set of coefficients would have to be determined experimentally for different ratios of the height of the tail water above the vertex of the notch.

With the aid of the grant placed at my disposal by the Association at last year's meeting, for the purpose of these researches, I have got an experimental apparatus constructed and fitted up at a place a few miles distant from Belfast, in Carr's Glen, on the grounds of Mr. Neeson, who has kindly afforded me all the necessary facilities regarding the water supply and the site for the experiments, and I have got some preliminary experiments made on a right-angled notch in a vertical plane surface, the sides of the notch making angles of 45° with the horizon, and the flow being from a deep and wide pool of quiet water, and the water thus approaching the notch uninfluenced by any floor or bottom. The principal set of experiments as yet made were on quantities of water varying from about two to ten cubic feet per minute, and the depths or heads of the water varied from two to four inches in the right-angled notch.

From these experiments I derive the formula $Q = 0{\cdot}317\, H^{\frac{5}{2}}$, where Q is the quantity of water in cubic feet per minute, and H the head as measured vertically in inches from the still water level of the pool down to the vertex of the notch. This formula is submitted at present tem-

porarily, as being accurate enough for use for ordinary practical purposes, for the measurement of water by notches similar to the one experimented on, and for quantities of water limited to nearly the same range as those in the experiments; but as being, of course, subject to amendment by more perfect experiments extending through a wider range of quantities of water.

Out of the grant of £10 from the Association for these experiments, the amount for which I have hitherto had to apply to the treasurer as having been expended in them is £8 0*s.* 4*d.*, which leaves a balance remaining of £1 19*s.* 8*d.*

It will be readily observed that the experimental investigations indicated in the foregoing report as desirable, are such as would require for their completion and extension to large flows of water a great expenditure both of time and money, like as has already been the case with researches on the flow of water in rectangular notches. All that I can myself, for the present, propose to attempt is to open up the subject with experiments on moderately small flows of water; and with this view I would be glad to be aided by a further grant from the Association in continuing experiments of the kind already undertaken.

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*Experiments on the Substitution of Coal for Coke in Railway Locomotives.**

That the consumption of smoke in coal-burning locomotives may be accomplished in a satisfactory manner was proved by experiments made some time since by Mr. Joseph Beattie, the talented manager of the London and South-Western Railway Company. In this case the invention made use of has received the approval of competent judges, and it has been patented, but it is stated there is one objection to its general employment. An expenditure of about £300 is required to adapt it to any engine previously in use, and on this account its employment has been confined to the new locomotives constructed. Assuming the duration of a locomotive to be from twenty to thirty years, a long time would elapse before the entire stock of a railway company would consist of engines so contrived. The directors of the Lancashire and Yorkshire and East Lancashire Companies have recently been aiming to accomplish the object by simpler and more direct means. The lines under the control of the two boards are nearly 400 miles in length, they employ about 300 locomotives, and the saving to be effected by using coal instead of coke would be at least £30,000 per annum. Mr. Jenkins and Mr. Lees, the locomotive superintendents of the two companies, have each perfected inventions which are exceedingly simple and inexpensive. That of Mr. Lees (of the East Lancashire) was put to the test on the 6th ult., on the railways between Manchester and Blackpool.

The distance from Manchester to Blackpool is 48 miles, and the 96 miles of line there and back was well adapted for a fair trial of the

* From the London Civ. Eng. and Arch. Jour., October, 1858.

invention. In going either way there are some severe gradients to ascend; two of them near Chorley, are as steep as 1 in 100; and there are also several sharp curves. For the purpose of the experiment a train was composed of fourteen or fifteen wagons loaded with old metal, two first-class carriages, and two break vans. The length of the train was 240 yards: its weight was estimated at 271 tons 15 cwt., including the engine and tender, which, when filled with coal and water, would be 41 tons 8 cwt. This is rather in excess of the average weight of ordinary luggage trains of thirty to thirty-four wagons. Mr. Fothergill, C. E., of Manchester, had charge of the experiment.

One of the main tests being to ascertain the economy of consumption, it was necessary to weigh the fuel upon the tender before commencing the journey. In this was included the quantity used for getting up the steam. For the same reason, on the return of the train, it was requisite to ascertain the quantity left in the tender and unconsumed in the fire-box. By deducting the latter items it was of course easy to calculate the net consumption and the cost per mile. Another important point was to see that the steam was kept as nearly as possible at an even pressure during the trip, and that to save fuel time was not lost in ascending steep gradients. Any delay of this kind would have to be compensated by great speed on more favorable parts of the line; and such irregularities might be a fruitful source of accident if allowed in the working of the ordinary traffic.

The train left the Salford station soon after twelve o'clock; and the journey to Bolton, a distance of 10 miles, and a rather heavy ascent, was made in thirty-five minutes. The distance from Bolton to Preston, 20 miles, was run in 43 minutes, and the remaining 18 miles in sixty-three minutes. The return journey occupied a much longer time, through detentions caused by trains being in the way, by rain having made the rails slippery, and other circumstances adverse to the experiment as regards economy. The results of the trip, however, were most satisfactory, the total consumption of coal being only about 39 cwt. for the whole journey. The coal used was that of the Ince-hall Company, at Wigan, costing 5*s.* 3*d.* per ton, and hence, the cost of the trip was about 10*s.* From experiments previously made, it appeared that with coke, which costs from 11*s.* to 11*s.* 6*d.* per ton, the expense of taking the train the same journey would have exceeded 20*s.* In two previous trials made by Mr. Fothergill—one with coal and the other with coke—over the same line, weather and circumstances being equally favorable to each, the cost was 9*s.* 5*d.* for the experiment with coal, and 22*s.* 3*d.* for that with coke. There seems to be no doubt therefore of the advantage of using coal in point of economy.

As regards the smoke-burning apparatus, the experiment was also highly satisfactory. The great desideratum is the proper admission of atmospheric air into the fire-box, and Mr. Lees secures it in a very simple and inexpensive manner. In the lower part of the fire-box door an opening is effected by an adjustable plate, and the admission of air can be regulated as desired. Inside the door is a hood, closed at the top over the aperture, and it acts as a deflecting plate to the air when admitted,

and forces it down upon the fire. Nearly at the further end, the fire-box is arched over with fire-bricks or tiles. The effect of the brick arch is, that on becoming red hot, it throws back the products of combustion, and thus causes a better mixing of the gases. If more desirable, the arch or mid-feather might be constructed of copper, with a water-space, so as to increase the heating surface of the boiler. The cost of the whole apparatus is only a few pounds per engine, and a sum of about 20*s.* per annum will be sufficient to keep each of them in repair. The directors of the East Lancashire Company have been so satisfied with its efficiency, that they have adopted it all but universally,—only two of their locomotives being now without it.

After careful observation throughout the journey, it was the general opinion that there was no smoke emitted from the chimney that could be considered a nuisance, or any thing approaching to a nuisance, by passengers or the public. There was occasionally a slight discoloration of the steam when more coal was added to the fire than is usually applied at one time, and the same is the case with coke; but the effect disappeared in a moment or two, and "the light and graceful steam cloud," as it has been termed, was left floating over the train as pure and white as it is ever witnessed during the consumption of coke. In some respects passengers will have occasion to rejoice at the change, for the little smoke that does from time to time escape unconsumed, when beaten down and confined in a narrow space by passing under a bridge or through a tunnel, is less sulphurous than coke: nor is it accompanied by such a cloud of small, sharp, blinding particles. If it could become offensive any where, it might be supposed to be so when the train comes to a stand in the large enclosed stations, and when the steam is shut off; but a contrivance, by which a jet of steam is thrown into the chimney during such stoppages, so nearly dissipates it, or prevents its formation, that the small quantity emitted is scarcely perceptible.

The wear and tear of fire-box and tubes is much lessened by the use of coal. In burning coke a large amount of sulphur is given off, which leaves a thick crust upon the tubes. This becomes so troublesome and destructive that engine-drivers are compelled to cleanse them at least once a day, and sometimes even more frequently. Such incrustation cannot be removed without more or less injury to the metal; and the sharp hard particles given out by coke fires, and drafted up the tubes, have the effect of cutting and wearing them away, especially at the edges. In burning coal the sulphur is supposed to pass off in a more volatile form, there is little or no incrustation, but the metal is found instead to be lubricated with a soft oily matter, which requires to be removed only about once a week. The economy in this respect will no doubt be considerable. During the experiments it was stated by Mr. Fothergill that the average duration of a set of tubes with coke would not exceed 94,000 miles; while with coal he had seen a set in use, and apparently not half worn out, after traveling 156,000 miles. The average with coal would probably reach 300,000 miles.

The best kind of fuel yet tried during the experiments to the present

time is said to be the Horbury coal. An experiment with Welsh smokeless coal entirely failed,—the bars of the fire-box getting clinkered over, so that the engine could not proceed.

On the following day an experimental trip was made over the same line of rails with the same train, but drawn by a locomotive having the smoke-burning apparatus invented by Mr. Jenkins, of the Lancashire and Yorkshire Company. This invention, which has been generally adopted by that company, is rather more expensive in its application than that of Mr. Lees, though still of very small cost; it is also very effective. Mr. Jenkins admits atmospheric air into the fire-box through a number of tubes in front of the fire-box and underneath the boiler. The outer part of the fire-box is furnished with a sliding plate, which can be worked by the engine-driver at pleasure, so that during the time of adding fresh fuel to the fire, by moving the plates the tubes are uncovered, and a good supply of oxygen is insured. He has also a perforated deflecting plate across the fire-box, to insure a better combustion of the gases, and prevent the escape of unconsumed carbon.

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*The Suez Canal Project.**

In the course of November next, says the *Daily News*, a general meeting will be held in Paris for the purpose of establishing a company for finally carrying out the project of the Isthmus of Suez Canal. The capital is said to have been nearly all subscribed in the following proportions:—

The Viceroy of Egypt, . .	£1,280,000
Turkey, Egypt, and Syria, .	840,000
France, . . .	1,600,000
Austria and Lombard Venetian, .	800,000
Russia, . . .	480,000
North of Germany, Sweden, Denmark, Hanseatic Towns, Prussia, Switzerland, Holland, and Belgium, . .	600,000
Spain, Portugal, Italy and Greece, .	400,000
United States of America, .	400,000
Leaving the portion reserved for England,	1,600,000
	£8,000,000

The whole capital to be represented by 400,000 shares of £20 each.

A New Method of Road-Making.†

The everlasting noise which is occasioned by the rugged material of our English roads, and the frequency of their being under repair, gives especial value to a fact which we find in the French papers. A new system of road-making has just been substituted for the ordinary roadway on a part of the Place du Palais Royal. A quantity of con-

* From the London Builder, No. 8 6.

† From the London Mechanics' Magazine, Oct., 1858.

crete, about 5 ins. in thickness, is first spread out, and on that is applied a layer of bitumen reduced to powder and in a boiling state. On this latter, which is also about 5 ins. in thickness, a quantity of river sand is sifted, and then the surface is pressed down by a heavy cast iron roller, weighing about two tons. In a few hours after, the road thus made may be passed over by the heaviest wagons without the slightest impression being left by the wheels. The same system is now being applied to part of the Rue St. Honoré comprised between the Palais Royal and the Rue de Richelieu, and in the latter street as far as the end of the Théatre Français.

Collapse of Flues.

The question of the resistance of thin tubes to collapse has recently occupied the attention of practical men; and some important facts, hitherto unremarked, or but partially investigated, have been brought to light. Mr. Fairbairn finds that the intensity of the pressure required to make a flue or other thin tube collapse, is directly as the square of the thickness, nearly inversely as the diameter, and *inversely as the length.* The diminution of the strength of a flue, as the length increases, is a law never before, it would appear, suspected. For computing the pressure in pounds on the square inch which a wrought iron flue can sustain, the following rule is sufficiently near the truth for practical purposes:—Multiply the constant factor 806,000 by the square of the thickness, in inches; and divide by the product of the length in feet, and diameter in inches. It is of great importance to strength that the flue should be as cylindrical as possible.—*London Artizan, Dec.*, 1858.

Experiments on Propellers.

In a former number of the *Journal*, we described a new propeller invented by Lieut. Vergne, the characteristic of which was the fluting or ribbing of the surface (*Journ. Fr. Inst.*, 3d Series, vol. xxxv., page 299). At the meeting of the Paris Academy of Sciences, 25th of October, 1858, M. Clapeyron presented the results of some experiments made with it.

Experiments on Le Vigilant.—The mean economy of fuel showed a gain in favor of the Vergne propeller of 17 per cent. The velocity was greater by more than half a knot, or 6 per cent. The new propeller turns more easily. The disturbance of the water near the stern disappeared; the wake was as smooth as that of a sailing vessel, and the whirlpool from the propeller appeared only at a distance of 7 or 8 metres astern.

Experiment on L'Austerlitz, reported by Lieut. Loyer.—With the former propeller the engines gave but 42 turns; the shaking disordered

(*fatigued*) the engines; now the apparatus turns with ease and remarkable regularity, so that we shall gain by increasing as much as possible the number of turns. The maximum speed obtained is 9 knots under all sail, and making 43 turns. We have frequently had 8 knots in a calm, and with 12 furnaces lighted, out of 20. The wake of the vessel is as smooth as that of a sailing vessel, and we remarked no shaking. At night, by means of the phosphorescence, we could trace the water thrown from the propeller; it was seen to be driven directly astern parallel to the keel, and with a helicoidal form.

Trip from Cherbourg to Brest.—The *Austerlitz* made 9 knots with 47 or 49 turns. Last year, the *Ulm*, of 650 horse-power, made much better time than the *Austerlitz*, whose engine is only 500 horse-power. Upon this trip the two vessels sailed at the same time, and excepting some little oscillations, sailed the whole time in company. With common coal, the log of the *Austerlitz* recorded 10 knots, while the helix made 50 and 51 turns, without any shaking.

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*On Boiler-plate Joints.**

In the discussion of boiler-plate joints, Mr. Clark demonstrates that the bursting strain on the longitudinal seams of cylindrical boilers is double the strain on the circular seams. This is an important practical distinction, because it is clear that, to ensure uniform working strength, the longitudinal seams must be doubly fortified; and, in the consideration of the means of soldering, four distinct kinds of riveted joints are compared, and their relative strengths determined from actual trials. Welded joints are likewise discussed, and should the reported results of their capabilities to resist bursting strains be corroborated by advanced experience, they promise to supersede riveting, if not entirely, at all events for the principal joints. In the order of tensile strength the joints are ranged thus:—

1. Scarf-welded joint,	100	
2. Double-riveted double-welt joint,	80	per cent.
3. Double-riveted lap-joint,	72	"
4. Lap-welded joint,	66	"
5. Double-riveted single-welt joint,	65	"
6. Single-riveted lap-joint,	60	"

In this comparative statement the strength of the entire plate is represented by 100; and the trials were made with plates varying from $\frac{3}{8}$ to $\frac{1}{2}$-inch in thickness. The relative strengths of single and double-riveted joints do not very materially differ from those deduced by Mr. Fairbairn.

* From the London Artizan, December, 1858.

AMERICAN PATENTS.

List of American Patents which issued from November 2 to December 7, 1858, (inclusive,) with Exemplifications.

NOVEMBER 2.

1. Method of Hanging Swords; Jonathan Ball, Utica, New York.

Claim—The arrangement and combination of the scabbard, plate, and bit-pin, with the belt or sash plate, as described.

2. Mechanism for Transmitting Rotary Motion; Gerard Bancker and Andrew Campbell, City of New York.

Claim—The use of the combination of the sliding clamping block and extension rod, with the double-acting clamping lever, made in the manner set forth.

3. Saw Gummer; Nelson Barlow, City of New York.

Claim—The arrangement of levers, C and D, rests, E and F, in combination with the milling cutter and clamp, as set forth.

4. Trucks for Locomotive Engines; Levi Bissell, City of New York.

Claim—The rigid truck frame attached to the engine by the bolt or pin, and receiving one pair of truck wheels, in combination with the double inclined bearings, for the purposes specified.

5. Tool for Chamfering Leather Straps; James Bridger, Richland, Iowa.

Claim—The tool described for chamfering and channeling leather straps.

6. Stoves; J. H. Buchanan, New Concord, Ohio.

Claim—The arrangement, consisting of the concave bed or ash-pit of larger diameter than the grate, and constructed with supporting lugs or ledges, semi-spherical open top grate or fire chamber, with draft space existing between it and the ash-pit or bed, and flaring stove-pipe, appearing as a continuation of the grate, and furnished with a transverse feed and draft door, and arranged above the fire grate, and made adjustable in a vertical line with the fire grate on a vertical standard, as set forth.

7. Gate Hinge; C. E. Burnham, Binghampton, New York.

Claim—The pintles placed within the sockets that are attached to the ends of the gate, in connexion with inclined planes and steps attached to the posts, the spring acting or bearing on the pintles, and the levers, or their equivalents, connected to the pintles through the medium of the rods and arms, as described.

8. Raking Attachment to Harvesters; W. W. Burson, Yates City, Illinois.

Claim—1st, The transverse hinging of frame for elevating the rake as it moves to the rear. 2d, Adjusting the rake in its position for starting by the gravity of the gear portion of the raking mechanism, combined with the transverse hanging of the frame, the operation being as described. 3d, The combination of the tilting platform, stubble leveler, and glancing board, with the rake for collecting and delivering the cut product. 4th, The combination of shaft, cam-wheel, spring, and slotted step, as set forth.

9. Arithmometer for Addition; O. L. Castle, Upper Alton, Illinois.

Claim—1st, Combining the shaft of the driving-wheel, which serves to give motion to the register, with the keys, by means of a series of ratchet-wheels on the said shaft, and a series of levers of different lengths which work on said shaft as a fulcrum, and are connected with the keys, when the whole are arranged as set forth. 2d, Combining the register wheels of lower denomination with those of higher denomination, by means of the pawls, ratchet-wheels, and stationary plates. 3d, The springs with their elastic arms, applied to the register wheels, in combination with the stationary plates and their projections, to operate substantially as set forth.

10. Railroad Ditching Machine; Wm. Chadwick and S. J. B. Anderson, Terre Haute, Indiana.

Claim—The levers, 2 4 7 and 9, arranged on a car, for holding the scoops at the side of the car, and for adjusting or raising and lowering them, as required. Also, the levers, 1 3 5 6 8 and 10, arranged on a railroad car for operating the scoops so as to catch their load of earth, and for dumping them as required. Also, the scoops, made so that they may be worked either end forward, the same side up to be filled. Also, the vibrating mouth-piece hinged to the scoop, so as to be vibrated substantially as described.

11. Car Axle Boxes; John W. Cochran, City of New York.

Claim—1st, The sliding collar, constructed and arranged upon the axle and in relation to the packing of the box, as set forth. 2d, The arrangement of the lubricator, door, disks, packing, follower, and bolts, whereby the whole may be adjusted to the bearing brasses, as set forth.

12. Machine for Cutting Corks; Edward Conroy, Boston, Massachusetts.

Claim—1st, The combination and arrangement of the sliding plate, V, sliding plate and spring or pointers, W, in front of the same, vibrating angular lever, Y, and cams, a a, on inclined revolving shaft, P2, partly cogged wheel, R, and spring arbor or shaft, T, for placing and securing the rough pieces of corks to be cut between the pointed end of the said arbor or shaft, T, and correspondingly pointed revolving hub, U′. 2d, The combination of the cam, K, secured to the top of the frame, A, and curved spring, J, with the sharpening device, G, and rotating cutter plate, H, for sharpening the cutters after they have cut the cork, and are in the act of being again withdrawn, and moved toward the arbor or shaft, T. 3d, The combination of the cam, o3, and friction roller, b, with the sliding frame, B, as set forth.

13. Grain Separators; William R. Cox, Delphi, Iowa.

Claim—The spouts, provided with the deflectors connected by the trough, and arranged relatively in respect to each other and to the spout and trunk, substantially as set forth. Further, in combination with the above, the loaded valve applied to the trunk, and used in connexion with the spouts, for the purpose specified.

14. Bank Locks; Lyman Derby, City of New York.

Claim—1st, The use of the bars or cross-bars secured on an axis eccentric to its true centre, for the purpose of obtaining gravity to unlatch them, in combination with the inside of the door of a safe or other place.

2d, The use of a pendulous latch lever, secured to the inside of a safe, in combination with the bars or cross-bars operating on the inside of the door of a safe. 3d, The use of the application of a clock-work movement, in combination with an inverted Y-shaped pendulous latch lever and bars or cross-bars, on the inside of the door of a safe, for the purposes set forth.

15. MANUFACTURING STEEL; Joseph Dixon, Jersey City, New Jersey.

Claim—The process of making steel by heating pig or cast iron, covered or stratified by any substance which will preserve a separation of the plates or pieces of iron through the process of heating, except so far as the use of oxide of iron as a separating material by any patent referred to.

16. HARPOON; George Doyle, Provincetown, Massachusetts.

Claim—1st. Attaching the shank of the harpoon to the head, so that when the latter turns in the fish, the flat side instead of the edge shall be presented to the resisting body. 2d, The slots and lip, operating substantially as set forth.

17. TACKLE BLOCKS; John Ferrier, Charlestown, Massachusetts.

Claim—Placing two rows of pulleys in each block, the axis of one row being at right angles to the axis of the other, and the rope passed or adjusted around the pulleys, as set forth.

18. GAS-FITTERS' VISE; Joseph S. Ford, Philadelphia, Pennsylvania.

Claim—The upper die and lower die, in combination with the screws, the said dies having two or more semi-circular recesses, situated in respect to each other and to the screws substantially as set forth.

19. CAR SPRINGS; Perry G. Gardiner, City of New York.

Claim—As my invention the following named improvements and features in the conical coiled steel spring, viz:—1st, Its construction out of a plate or bar not thinned, slotted, or hammered out at the ends, which is to constitute the apex of the spring. 2d, Nicking or compressing the face of the plate (as shown at the line,) without breaking or cutting the fibre of the metal, for the purpose described.

20. PLOUGHS; John Gehr, College of St. James, Maryland.

Claim—The hollow corrugated roller, in combination with the mould-board, brace, and guard, arranged substantially in the manner set forth.

21. STRAW CUTTERS; Oliver C. Green, Dublin, Indiana.

Claim—The described arrangement of the hinged connecting rod, lever, spring, pin, sliding gate, and oblique knife, with the V-shaped knives at the end of the trough.

22. JOINT FOR T-RAILS; Wm. Harvey, Albany, New York.

Claim—The arrangement and combination of the laterally tongued side plate with the rails, chair, and side piece, as described.

23. RAILROAD CHAIRS; P. F. Hall, Troy, New York.

Claim—The combination of the plates, b b c, and lips or jaws, a and c, together with the draw bore spiking of the same, by which they are keyed and also wedged and fastened to the tie by one operation, as specified.

24. SEEDING MACHINES; Aaron Hatfield, Petersburg, Illinois.

Claim—The arrangement of the seed hoppers represented, in combination with the mechanism for driving the seed slides and dropping the grain or seeds, and covering them as described.

25. DRINKING CUP; Louis Grosholz, Philadelphia, Pennsylvania.

I do not desire to confine myself to the employment of three sections, inasmuch as two might be used for a small sized cup, and for those of a larger size, four or five sections might be advantageously employed.

Claim—A drinking cup formed of two or more sections with inclined sides, said sections being adapted to, and detachable from, each other, substantially as set forth.

26. SEEDING MACHINES; Wm Y. Henry, Monmouth, Illinois.

Claim—Connecting or arranging the levers or rods of the pestles or weights, and the levers of the tubes, when used in combination with the wheels connected with the slide, and the whole arranged to operate as set forth.

27. TAP FOR CUTTING WOODEN SCREWS; W. O. Hickok, Harrisburg, Pennsylvania.

Claim—Making screw-threads around the outer surface or periphery of the cylindrical projection, so that they shall operate in the manner and for the purpose described, the said projection being made slightly larger than the hole in the wood in which the required screw is to be cut.

28. DIE FOR CUTTING WOODEN SCREWS; W. O. Hickok, Harrisburg, Pennsylvania.

Claim—The reduced sectional thread, in combination with the first cutter, when the same is made to operate in the manner set forth.

29. IMPROVED LOCK AND KEY; Joseph Hoffacker, City of New York.

Claim—1st, Constructing a lock which is closed or locked by the bolt shooting forward and upward, and which is opened or unlocked by a screw-key urging the bolt downward and backward. 2d, The construction of the bolt, in combination with the barrel and three springs. 3d, The combination of the door handles with the lever. 4th, The construction and operation of the screw-key, substantially as described.

30. THRESHING MACHINES; Abram Jackson, Lebanon, Tennessee.

Claim—The arrangement of the band wheels upon the spokes of the wagon wheels in connexion with the hounds, substantially as described.

31. FILTERING COCK; Lemuel P. Jenks, Boston, and Francis Draper, East Cambridge, Massachusetts.

Claim—The combination and arrangement of a filtering cock, substantially as described, giving the optional transmission of the water through the filtering medium in either direction, or through the filtering case, the former without unnecessary impediment to the current, by one passage across the width of the filter from a rotating two-way cock placed by the side of the filtering medium, and closed or discharging at pleasure, the filtering case and the filtering medium being stationary.

32. SAUSAGE MACHINE; R. V. Jones, Johnstown, Pennsylvania.

Claim—The arrangement of flanched cylinder with a knife having hooked or V-shaped teeth, substantially as specified.

33. Shield Pins; Josee Johnson, City of New York.

Claim—Shielding the point of the pin within folds or coils when turned on both sides of the main stem, as described.

34. Car Seats; P. P. Joseff, Philadelphia, Pennsylvania.

Claim—The combination and arrangement of the slotted vertical bar, having grooved wheels on its face, cogged plate, pinions, radial arm, and wrist-pin or stud, projecting from the end of the movable seat bottom and jointed crank, in the manner described.

35. Sash Fastener; Edward M. Judd, New Britain, Connecticut.

Claim—Attaching the rod to the spring by means of the grooves in said rod, the button at its end, and the hole and slot in the spring, substantially as set forth.

36. Seeding Machines; H. Kaller, Perry, Illinois.

Claim—The cylinders provided with the seed cells, having the slides attached and arranged within the tubes, and relatively with the hoppers to operate as set forth.

37. Straw Cutters; James Lashbrooks, Rockport, Indiana.

Claim—The two rollers provided with the circular toothed blades, in combination with the clearers, arranged to operate as set forth.

38. Miners' Railroad Turn or Circular Switch; E. B. Lowman, Bellair, Ohio.

Claim—The arrangement of the crossings, as seen at letters c, d, e, f, m, n, and l, fig. 1, together with its adaptation to the working of miners on either side of the entry, by reversing its position on the main stem.

39. Machine for Soldering; E. Manley, Marion, New York.

Claim—Arranging within and in the desired relation to the furnace, mounted on wheels, and constructed as set forth, an inclined copper bar or soldering tool, having notches on its lower surface, and a wedge or key above, for retaining it with the required degree of heat, in combination with the inclined conducting tube and hinged box, and its attachments divided into two compartments for the solder scraps and resin.

40. Smoking Tube; Charles Matthews, City of New York.

Claim—Arranging the tubes, c and e, with the mouth-piece, in such relation to each other that they form a compound smoking tube for smoking tobacco, or other substances, in a finely divided state. Also, closing the upper end of the tube, e, in such a manner that the same when inserted into the draft tube, c, and brought close up to the inner end of the mouth-piece, leaves a sufficient space for the passage of the smoke up through the central opening of the mouth-piece described. Further, constructing an ash-pan in such a manner that the same slides on the compound smoking tube by means of a loop, so that the ashes dropping from the lighted end of the tube are deposited in the ash-pan.

[This invention consists of two tubes of thin paper, one of which fits into the other, with barely space between for the passage of the smoke. The inner tube is closed at the bottom by an oblong piece of stiff paper bent over its end in the shape of a letter U, and contains the substance to be smoked in a state of fine powder. A firm and thick paper tube, from 1½ to 2 inches long, is fitted into one end of the outer tube, to serve as a mouth-piece, and also as a support for the inner tube—of which the closed end reaches and is fastened to it, but so as not to close it (viz: the mouth-piece,) entirely; the curved form of the end of the inner tube permitting the smoke to pass freely on either side of it. This compound tube, when filled, is twisted to a tapering end, which, when used, is inserted into the collar of the ash-pan, which is an oblong dish or pan, about 2½ inches long, of very light metal, in the form of a trough, having at one end a collar or loop of proper diameter and half an inch long. The object of this pan is to catch the ashes, and as the cigar burns away, the pan is made to slide along towards the mouth of the smoker.]

41. Ploughs; A. A. McMahen, Oxford, Mississippi.

Claim—In combination with a coulter having a brace and adjusting openings therein, a mould-board whose shank is made adjustable in the beam, so that said mould-board may be adjusted to the coulter and in the beam, as described.

42. Presses for Embossing and Figuring Velvets, &c.; John Nagle, Altoona, Pennsylvania.

Claim—1st, The application of steam to presses for figuring silks, velvets, and similar materials. 2d, The combination of rollers, a, b, b, c, with the wheels, r r, and chain, z. 3d, The double lever, in combination with the chain, h, and weight, w. 4th, The movable guide, in combination with the rollers, all in the manner described.

43. Refrigerator; Benjamin M. Nyce, Kingston, Indiana.

Claim—1st, The employment of the fan, when arranged as set forth, for producing a circulation of the contained air, so as to bring it in immediate contact with the lime, or other dessicating composition, for the purposes specially set forth. 2d, The peculiar construction of the beam, t, that is to say, I claim the metal bar, x, the insulating beam, v, the trough, y, and supporting beam, u. 3d, The partition, when arranged and operating substantially in the manner set forth.

44. Trap for Animals; R. L. Payne, Halifax, Virginia.

Claim—The arrangement of the separate balanced fingers in connexion with the box or body of the trap, as described.

45. Tripping Block for Boat Davits; Charles Perley, City of New York.

Claim—The tripping or disconnecting block, constructed as specified, and applied to davit blocks for boats or to other purposes, as set forth.

46. Method of Adjusting the Plummet without moving the Tripod in Surveying Instruments; Charles A. Saxe, Philadelphia, Pennsylvania.

Claim—The arrangement described for placing surveying instruments' centres over any point within the circle, k, without moving the legs of the instrument, and unscrewing the leveling screws, but by unscrewing the screws, c c, moving the ball plate, a, and revolving the ring, h, as described.

47. Hand Printing Presses; J N. Phelps, City of New York.

Claim—1st, The combination and arrangement of the radial pins on the transverse shaft and shoulder cams on the sides of the lever, oscillating arms, j, spiral springs, u, for moving the same automatically, and spiral springs for pressing the inking roller in contact with the printing rollers, q r, when receiving the ink from the same, and in contact with the face of the type in the form secured to the under part of the platen. 2d, Arranging the inking rollers, q r, in the relation to each other and to the inking roller, k, at the lower end of

the bars or arms, and the lower surface of the platen, when raised as described, and in combination therewith. 3d, The segmental shield or plate, so arranged in relation to them and the corresponding segmental formed arm or support, as to thoroughly protect the sheets of paper being imprinted, from contact with the said inking rollers, and enable its edges to be moved upward in the space between the shield or plate, and arm or support, substantially as described.

48. Lifting Handles; Joseph B. Sargent, New Britain, Connecticut.

Claim—"A lifting handle" with the plate cast in any metal that can be bent, having the socket formed in the manner described, and operating in connexion with the handle, as specified.

49. Hemp Brakes; William Shelby, Waverly, Missouri.

Claim—The arrangement of the beaters or blades at varying distances, in combination with the yielding plates, as described.

50. Combined Book and Slate; Forrest Shepherd, New Haven, Connecticut.

Claim—The combination of the slate with the book, when so connected and arranged that the slate can be used with equal convenience and facility with each page of the book, while the page and the slate are continually before the eye of the user, as represented.

51. Car Seats; John W. Sibbet, Cincinnati, Ohio.

Claim—Constructing every alternate seat in two distinct parts, and providing the upper detachable portions with guiding hubs at their ends, to which are attached straps or bands for elevating them, horizontal spring bars whose ends enter slots in the guide columns or posts for sustaining them, in conjunction with the straps or bands in their elevated portions, and combining with the said upper detachable portions and the permanent seats pieces of cushioned or stuffed cloth, or other material, capable of being packed in the boxes of the seats, the whole being constructed substantially as described.

52. Railroad Chairs; James H. Simmons, Painted Post, New York.

Claim—The construction of a chair raised in the centre for the ends of the rails to rest on, and sloping from near the centre toward each end of the chair, leaving a space between the rails and the chair over the sloped portion to accommodate the spring of the rails together with projections, as described.

53. Candlesticks, &c.; Samuel Slocumb, Cambridge, Massachusetts.

Claim—A lamp stand having a metal socket, a glass shank, and a marble base, the whole being secured together by the rod, D, as set forth.

54. Preparing Wool and other Fibres for Spinning; Waterman Smith, Manchester, New Hampshire.

Claim—In the process of drawing wool and other fibrous substances, heating the sliver of wool, or other substance, and keeping it hot while it is being drawn, by passing it over or against, and in contact with, heated surfaces, either moving or stationary, substantially as described.

55. Machine for Creasing and Blacking Leather for Harness; Adolph Stempel, Oquaroka, Illinois.

Claim—The pressure rollers and the creasing and embossing rollers, in combination with the color fountains and felt rolls, the whole being arranged as set forth.

56. Pedal Attachment for Pianos; Wm. B. Stetson, Taylor, New York.

Claim—The construction and arrangement of the pedal chord bars, connecting suspension rods, and upper bars, and finger rods, and operated as described, in combination with key-board instruments, and whereby the corresponding harmony of any melody or air is produced simultaneously therewith by the performer, through the agency of the feet.

57. Safety Apparatus for Steam Boilers; Francis Stebbins, Hinsdale, New Hampshire.

I am aware that it is not new to so combine a vessel with a boiler and an alarm or signal apparatus, that such vessel, when the water in the boiler may be above its lowest safe water level, shall be kept filled with water by the pressure of the steam, and when such water may fall below such level of safety, such vessel, by the entrance of steam into it, shall be emptied of its water, and thereby, by the abstraction of the weight of water from such vessel, the alarm or signal apparatus shall be put in operation, and therefore I do not claim such. Although I maintain this principle of operation in carrying out my invention, I effect an important and valuable improvement, as my invention rests on an improved mode or means of carrying out such principle, and consists in an arrangement of pipes with respect to the vessel and boiler, whereby the steam and water passages are entirely separate from one another, so that the water does not hinder or obstruct the passage of the steam from the boiler to the vessel, D, one not having to rush directly by, and in contact with, the other, while the steam may be flowing into the vessel, D, of the safety apparatus. Furthermore, my arrangement presents other advantages as by means of it the safety apparatus is entirely out of the boiler, and is not liable to be injuriously affected by the foaming of the water in the boiler.

Claim—The improved safety apparatus, as specified, or the above described arrangement of the two separate steam-pipes, the two separate water-pipes, and tubular shaft, together and with respect to the boiler, A, the vessel, D, and its loaded level, C, and so as to enable the whole to operate substantially as explained.

58. Speed Indicator and Recorder for Railroad Cars; J. Dutton Steele and William Lorenzo, Pottstown, Pennsylvania.

Claim—The governor shaft and indicator, and the shaft carrying the prepared paper, in combination with the main driver, as described.

59. Harvesters; Charles T. Stetson, Amherst, Massachusetts.

Claim—Combining two double-edged cutting blades with each of the vibrating cutter shanks, for the purpose of reducing the number of joints in the cutting apparatus. Also, combining an inwardly extending curved arm with the inner end of the finger bar, when the vibrating end of said arm is made to play between guiding cheeks or in a guiding groove, and the said inner end of the finger bar is jointed to a vertically sliding head substantially in the manner set forth.

60. Lock; O. B. Thompson, Hudson, Ohio.

Claim—The tumblers, f, and guards, g, constructed, arranged, and placed in such relation with the plate, b, of the bolt tumbler, c, and slides, j, to operate as set forth. Also, in combination with the above parts, the bar, arranged so as to be acted upon by the arbor bit to adjust the tumblers, f, as the bolt, B, is shoved out from the case. Further, the plate, l, and buffer, m, placed at the back part of the slide chamber, E, substantially as set forth.

61. Seeding Machines; Joseph Walton, Delavan, Wisconsin.

Claim—The rotary disk, in combination with the throat, the partition, the valve, the finger, and the grass seed hopper, when the whole are arranged as set forth.

62. Car Brakes; J. N. Ward, Brooklyn, New York.

Claim—The combination of the pulleys and brakes, together with the mode of operating the same, the whole being constructed and arranged as specified.

63. Self-inking Hand Press; Daniel Zuern and L. L. Bevan, Shamokin, Pennsylvania.

Claim—The combination of the arm or lever, G, with the shaft, H, the crank, I, and the vertical revolving shaft, J, and the connexion of shaft, J, with the revolving arm, K, thereby accomplishing a double action, viz: first, upon the ink roller, D; second, upon the movable bed, E, for the reception of card or paper to be stamped or printed—by down vertical pressure of lever, A, roller, D, moves horizontally over ink sponge, F, and in contact with it. Also, the combination of finger, d, with hook, e, on movable bed-plate, with the mode of adjustment and disconnexion, for the purpose of effecting movement of movable bed-plate, E, and also the movable bed-plate, E, for the purpose substantially as set forth. But we do not claim any other part or portion of the machine as new, or of our invention.

64. Axle Boxes; Henry Howson, Assignor to Isaac P. and Jacob L. Wendall, Philadelphia, Pennsylvania.

Claim—The combination of the box with the bearings, B and B′, and retaining keys, C and C′, when the interior of the box is arched on the top, when the said arch terminates on each side of the recesses, g g, formed in the sides of the box, when the keys are adapted to fit into the recesses and against the edges of the bearings, and when the several parts are arranged in relation to each other, substantially in the manner and for the purpose set forth.

65. Weighing Carts; James W. Martin, Assignor to Lewis Rothermel, Philadelphia, Pennsylvania.

I do not claim the application of a scale beam to a cart, for the purpose specified, for this has been formerly done, and may be seen in the device patented by me, and formerly alluded to.

Claim—The shaft, E, provided with hooks, d d, and arms, e e, which are connected by rods, f f, with lever, h, having their fulcra, i, connected by pendants, j, to the arms, k, of a shaft, l, which is connected with the scale beam, G, by the arm, o, and rod, a, the rods, q, of the body resting on the lever, h, when the latter raises the body, and the latter provided with the rod, c, for the hooks, d, to catch over, the whole being arranged substantially as set forth.

66. Padlocks; E. M. and J. E. Mix, Assignors to selves and C. D. Johnson, Ithaca, New York.

Claim—The combination of the curved or bent tumblers, a, and dog, D, provided respectively with springs, c k, and arranged relatively with the bolt or shackle, B, to operate as set forth.

67. Billiard Table; Daniel D. Winant, City of New York, Assignor to William R. Winant, Brooklyn, New York.

Claim—1st, Constructing the beds of billiard tables of slabs of glass, substantially as specified. 2d, The clips, c c, taking the beveled edges of the slab to retain the same, as described. 3d, The block, e, receiving the screws, g, of the cushion rail, as described.

68. Mechanical Movement; Joseph H. Davis, Woburn, Massachusetts.

Claim—The arrangement set forth for transmitting power from any prime motor to a propelling gear or wheel, viz: through the intervention of a series of curved or bent and weighted arms, said arms working together and connected to the gearing at their ends, substantially in the manner set forth.

69. Rudder for Vessels; Silas Yerkes, Jr., Assignor to self and George Yerkes, Philadelphia, Penna.

Claim—The gearing of the outer or aftermost of the two hinged portions of the rudder with a fixed gear or toothed arc attached to the vessel, substantially as specified.

[This rudder is made in two parts, called by the inventor the "main rudder" and "outside rudder." The former is hinged in the same manner as a common rudder, to the stern-post of the vessel, and the other one is hinged in a similar manner to the back of the fast one, and has secured to it a concentric toothed gear, which gears with a stationary toothed arc, concentric with the first one. The main rudder is operated in the usual way, and by its action the outside one is caused, by the arc and gear, to move faster in the same direction, and the two combined produce a greater effect on the water by a given movement of the steering apparatus than a single rudder presenting the same area of surface.]

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70. Knitting Machines; Walter Aiken, Franklin, New Hampshire.

Claim—The peculiar shaped cam groove, constructed as described. Also, the selvage fingers, as described.

71. Revolving Fire Arm; Ethan Allen, Worcester, Massachusetts.

Claim—1st, Forming the stud or pin to support the tumbler and hammer solid with the case or frame, when the hammer is placed outside the case, as described. 2d, The cam surfaces of the tumbler and piece, L, or their equivalents, to rotate the cylinder, by means of the piece, M, in the manner set forth.

72. Flour Coolers; Horace B. Allis, Little Rock, Arkansas.

Claim—The combination with a cooler hung so as to revolve upon a nearly horizontal shaft of nearly radial screens; and also the combination therewith, as an auxiliary to accomplish the desired result, of the solid flanches for checking the motion of the meal till the screens have arrived at the proper angle to properly distribute the meal.

73. Sewing Machines; Otis and Zelotes W. Avery, Bethany, Pennsylvania.

Claim—The combination of the rocker or yoke, pivoted as described, and the presser, operated as set forth, for the purpose of firmly holding the cloth whilst it is being fed up or moved, as represented. Also, in combination with the beam, H, and its cam, q, the bar, o, and its cam, r, when said parts effect the purposes described.

74. Hoisting Machines; Daniel W. Barr, Lancaster, Pennsylvania.

Claim—The central pulley, beveled cog-wheels, and drums, side wheels, double pulley hoisting tackle, slide door, drum and crank, with cord.

75. Apparatus for Wetting Paper; Moses S. Beach, Brooklyn, New York.

Claim—The employment of the cloth, arranged and operated substantially as described.

76. Printing Presses; Moses S. Beach, Brooklyn, New York.

Claim—Producing intermittent blasts of air by means of the revolving hollow core having openings, and the stationary box having openings, arranged as described.

77. FEEDING OUT PAPER FROM PRINTING PRESSES; Moses S. Beach, Brooklyn, New York.

Claim—1st, The stationary guides and the arrangement of the rollers, or their equivalents, by which sheets coming from different directions are conducted into a single set of guide tapes or strings, in the manner described. 2d, Counting sheets into desired quantites by a counting table, consisting of an endless belt having an intermittent motion, arranged as described.

78. BLACKSMITHS' TUYERE; Harvey S. Berry, Rutland, Vermont.

Claim—A tuyere revolving in a wind-box supplied with wind in any ordinary way, with apertures in it, so arranged as to bring more or less of them at pleasure to bear upon the fire, and thereby diminish the fire and circumscribe the space affected by the blast, or enlarge the space and increase the fire.

79. PLOUGHS; John M. Burke, Dansville, New York.

Claim—Depressing and bending inward the rear and lower edge of the mould-board, as described.

80. MACHINERY FOR PRESSING TOBACCO; Wm. Cameron, Petersbnrg, Virginia.

Claim—1st, The construction of the ring which contains the tobacco boxes, viz: by segments held together by a band which can be tightened or loosened, and move independent of said segments, as set forth. 2d, The forming of a press by means of one, two, or more of such rings, enclosing a series of tobacco boxes with plates above and below them, and screw-rods furnished with hand wheels and nuts passing through said rings and plates.

81. RENDERING PAPER AND OTHER FABRICS INCORRODIBLE; Thomas G. Chase, Philadelphia, Pennsylvania.

Claim—The application of paraffine either alone or in combination with naphtha, for the purposes described, so as to secure paper and other fabrics from the corrosive action of caustic alkali, in order that it may be put up securely in small parcels.

82. PROPELLER; George R. Comstock, Little Falls, New York.

Claim—The series of spring blades, hung and reversed, in combination with the cutting edges of the vibrating frame, the operation being substantially as specified.

83. PEN FOUNTAIN; John S. Cutts, Philadelphia, Pennsylvania.

Claim—The elastic tubular fountain open at both ends, and so combined with the pen that the fountain may be filled with ink through its upper open end by dipping the pen, as set forth.

84. LACTEAL INSTRUMENTS; Charles H. Davidson, Charlestown, Massachusetts.

Claim—Constructing the article known and worn as "breast shell," and made of any size, form, or material suitable for the performance of the well-known functions or uses proper of such device, with a transfer pipe or tube forming an integral part of the shell, when said tube is arranged as described, and serves for the ready and advantageous attachment of a flexible pipe with nipple jointed to it.

85. AQUARIA; Elijah D. Davis, Brooklyn, New York.

Claim—1st, The mirror extending above the level of the front plate, and arranged in relation thereto, and to the contents of the aquarium, substantially in the manner set forth. 2d. The sustaining of the earthy matter in removable bottom, and protecting its upper surface by a hand coating, for the purposes as set forth.

86. CUSHIONS FOR BILLIARD TABLES; Levi Decker, Bergen, New Jersey.

Claim—The combination in a billiard table cushion of stretched and unstretched rubber, for the purpose described.

87. LIFE-PRESERVING VESTS; T. A. Delano, City of New York.

Claim—A life-preserver having elastic fastenings or straps, and an inflatable air chamber or float, extending from the breasts underneath the arm holes, as described.

88. OPERATING CHURNS; Joseph Forsyth, Wheeling, Virginia.

Claim—The combination of the carriage with the movable platform, substantially as described.

89. METHOD OF OPENING AND CLOSING FARM GATES; Wm. G. Hermance, Geneva, New York.

Claim—The suspension of the gates by means of suspension bars of unequal length with pulleys and slat heads, arranged as set forth.

90. BURGLARS' ALARM; N. Jensen, Washington City, D. C.

Claim—1st, Supporting the taper by a spring socket, arranged substantially as described, so that by the movement of the socket when the holding catch is withdrawn, the taper is lighted. 2d, On releasing the spring socket holding the taper, I claim lighting the taper and causing the alarm to be sounded by the movement of the socket. 3d, Arranging the alarm and the light in separate compartments in the box, for the purposes set forth. 4th, The fuse tube, constructed and arranged as described, so that the gases escaping from the vent will pass over the flame, and not come in contact with and extinguish the light.

91. SLEEPING BERTHS FOR RAILROAD CARS; D. M. Lawrence, Cincinnati, Ohio.

Claim—The arrangement of the strap hinge, in combination with the ball and socket hinge, for the purpose of securing adjustable platforms or sleeping berths for railroad cars at any desired elevation.

92. ROTARY HARROWS; Wm. H. Main, Liverpool, Ohio.

Claim—The combination of the arm or centre pin, draft bar or platform, with the seat, for the purpose of causing the harrow to rotate by the weight of the person on the seat.

93. PRINTING PRESSES; Charles Montague, Hartford, Connecticut.

Claim—Communicating motion to the cylinder at the time of giving the impressions, by and through the motion of the bed, while the revolution of the cylinder shall be perfected by or through ordinary gearing, or other means entirely independent of the motion of the bed, thus alternating from one of these means to the other, to give a full revolution to the cylinder, in the manner substantially as set forth.

94. SHEARS FOR CUTTING SHEET METAL; Daniel Newton, Southington, Connecticut.

Claim—The application to circular shears of two rods with a revolving cutter on each rod, sliding either way, to adjust the size of the circle.

95. GALVANO-ELECTRIC MACHINE; Joseph R. Palmenberg, City of New York.

Claim—The arrangement and construction of a magneto-galvano electrical machine, having the helix and spring hammer, &c., situated in the inner part of the block or stand which supports all the other parts, and protected from any external danger through which the action of the apparatus might be deranged, substantially as specified.

96. Bee-Hives; Ebenezer W. Phelps, Elizabeth, New Jersey.

Claim—The small sectional adjustable frames, set in the main frames by means of half round grooves and rod, operating as described.

97. Securing the Ends of Railroad Bars; Augustus Plinta, Albany, New York.

Claim—The formation of a smooth joint where the ends of hollow rails meet, by inserting therein a plug of iron or dowel, movable by a pin, in combination with a transverse wedge, washers, and wedge-shaped spikes, combined and arranged substantially as described, when used without a chair.

98. Harvesters; Hosea W. Read, West Windsor, Vermont.

Claim—In its arrangement and combination with the tilting frame and the machinery for operating the cutters applied thereto, as described, a screw-rod or mechanism for spreading the bars of the tilting frame asunder, so as to throw the pinions of the cutter mechanism out of engagement with the gears of the driving-wheels.

99. Frames for Umbrellas and Parasols; Frederick Reichhold, City of New York.

Claim—Making the stretcher and rib of two wires each, forming the loops or eyes of the rib by coils of the exterior wire, and attaching the stretcher to the rib, the rib to the notcher, and the stretcher to the runner, by coils or hooks of the exterior wire.

100. Drop for Forging Metals; E. K. Root, Hartford, Connecticut.

Claim—The method of elevating the drop or hammer by means of a lifting strap having a vertical reciprocating motion, in combination with the retaining notches and pawls and the spring bolt, or their equivalents. Also, the method of disengaging the drop or hammer from the elevating straps by means of a wedge-shaped shoe on the strap, which strikes the end of the bolt, or its equivalents, and forces it clear of the strap, and into engagement with the retaining latch. Also, the employment of an adjustable disengaging shoe, in combination with the series of retaining notches and pawls, whereby the hammer may be readily disengaged from the lifting straps, and retained at any desired height from the base block. Also, the sliding ratchet bar, in combination with the retaining notches in the posts, and retaining pawls on the hammer, when arranged as described. And finally, in combination with the bolt which forms the connexion with the elevating strap, and with the retaining latch which holds the slide when disengaged from the elevating strap, or their equivalents, the employment of the angular lever, or its equivalent, by which the hammer may be readily disengaged from the elevating strap by the operator at any required point in the ascent of the hammer.

101. Connecting Metallic Tiles, Plates, Beams, &c.; Silas T. Savage, Albany, New York.

Claim—The application and use of hook and clasp-shaped terminals, at the ends or edges of malt kiln tiles and beams, or analogous structures, such as floors and beams of any kind, for the purpose of attaching them to each other, and supporting them firmly in a proper position.

102. Manufacture of White Lead; Benjamin F. Smith, City of New York.

Claim—Preparing the metallic lead for the purposes of perfect corrosion, by exposure to the action of acids, or other substances, in "spangles" of the size and configuration, substantially as described. Also, preparing the metallic lead for the purposes of perfect corrosion by exposure to the action of acids, or other substances, by causing melted lead to drop in a finely divided stream or streams upon a corrugated cylinder, or its equivalent, revolving or moving so as to throw off solid "spangles" of more or less the form and thickness described.

103. Elastic Material for Mattresses and Cushions; Thomas B. Smith, Marietta, Ohio.

Claim—The compound coil of spiral woody fibres described, when prepared as described, and used as a substitute for curled hair.

104. Machinery for Manufacturing Shirred Goods; Richard Solis, New Brunswick, New Jersey.

Claim—In combination with the rollers, or equivalent means for cementing the two lamina of cloth, and the rollers, or equivalent means, for keeping the united lamina distended, and for moving them as described, the employment of a bar, or the equivalent thereof, over which the united lamina are drawn to form the turned or lapped selvages. Also, in combination with the selvage bar, or its equivalent, and the means described for moving and keeping the lamina distended, or equivalents therefor, the employment of pins for turning the edges in forming the turned or lapped selvages.

105. Shirt Bosom Folders; John Stevens, City of New York.

Claim—The combination of a series of tins made with a series of pins, arranged in a slot in the angle irons attached to the bed-plate, the pins being adjustable, by means of which the plates can be made of any desired width without different sizes of tins, with the lifters for raising the tins from the pins.

106. Machine for Filing Saws; C. and R. D. Tabor, Ischua, New York.

Claim—The use of the file carrier and pressure frame, in connexion with the carriage, clamping jaws, and revolving platform, when constructed as specified.

107. Furnaces for Tempering Steel; Joseph Thomas, City of New York.

Claim—Arranging a plate, B, in an upright furnace with a central passage, a, in such a manner and in such relation to a tank, D, containing water or other suitable liquid, that a piece of steel wire or a strip of sheet steel may be heated and hardened without coming in immediate contact with the fire, by passing the same through the passage, a, and through the liquid contained in the tank, D. Also, arranging the two furnaces, A and E, and the tank, D, in such relation to each other that a piece of sheet wire or a strip of sheet steel may be hardened and tempered by one operation by passing the same through the plate, B, in the furnace, A, and through the liquid contained in the tank, and from thence between the plates, F and G, which are heated by the fire in the furnace, E.

108. Fringe Looms; Samuel Walker, Roxbury, Massachusetts.

Claim—1st, Riveting the thread carriers to a reciprocating frame, moving with the lathe. 2d, The guard plates, attached to the knife and operating in the manner substantially as set forth. 3d, Depressing each loop of fringe as it is formed, by means of the fingers, or their substantial equivalents, for the purpose of preventing them from being entangled and twisted up with the succeeding loops. 4th, Twisting the weft thread immediately before the loops of fringe are formed by pivoting its spool upon a revolving carriage.

109. Lathe for Turning Wood; Albin Worth, Stapleton, New York.

Claim—1st, The eccentric, A′, connected with the tool, v, and rotated through the medium of the gearing, q′ r′ s′, or q′ t′ r″ s″, or their equivalents, from the mandrel, a, so as to turn or cut the work in oval or polygo-

nal form. 2d, The combination of the patterns, S T, the eccentric, A′, and cutting tools, P U V, attached to the slide rest, G, and the feeding device formed of the screw, E, and nut, i.

110. Machine for Coiling Metal Pipes; P. D. Weimer, Lebanon, Pennsylvania.

Claim—1st, The coiling of hot or cold metal pipe on a plain cone or cylinder, by means of a movable groove or die. 2d, Feeding the movable groove or die forward, so as to form the coil by means of a pattern coil, or its equivalent, as described.

111. Sewing Machines; C. D. Wheeler, City of New York.

Claim—The combination of a sheave whose groove is sharp, or so constructed that the thread may jam therein by a partial passage around the sheave, with an adjustable friction brake to control the movement of the said sheave.

112. Rock Drills; Lyman White and J. T. Bumgarner, Davenport, Iowa.

Claim—1st, The combination of the cam, D, swinging adjustable frame, B, slide bar, E, and screw-rod, G, containing the drill rod, K, arranged substantially as set forth. 2d, The combination of the adjustable plate, J, attached to the frame, B, arm, I, nut, H, with collar, K, and pawl, j, attached. 3d, The spring, u, interposed between the lower collar on the drill rod and the lower end of the screw-rod, for the purpose specified. 4th, Placing the screw-rod, G, on the drill rod, K, between two adjustable collars, t t, so that when the screw-rod has been fed or moved down the distance of its length, it may, by loosening or detaching the collars, be raised on the drill rod and secured upon it higher up in order to continue the work.

113. Grubbing Machine; T. C. Wood, Charleston, Michigan.

Claim—The arrangement of the lever, the hinged supporter, the cord, the elliptical block, and hooks, all being secured in the carriage substantially in the manner specified.

114. Locks; Linus Yale, Jr., Philadelphia, Pennsylvania.

Claim—Providing a main bolt or bolts with two or more systems or sets of stops or tumblers, or their equivalents, whether alike in form and construction or dissimilar—commanded by or obedient to one and the same key, or its equivalent, or by separate and distinct keys, or their equivalents, so placed and arranged, whether near or distant, that when its key is applied to either one set, that set shall release the bolt irrespective and independent of either of the other sets.

115. Railroad Car Wheels; Thomas C. Ball, Assignor to self, L. Bisco, A. S. Davis, K. Crossfield, E. Edwards, and Jacob Green, Keene, New Hampshire.

Claim—(For a car wheel, with an insertion of rubber, or other elastic substances, between the two parts), the making of the rim or tire and its flanch in one piece, for the purpose of strengthening each other. Also, the mode of confining the two parts together, by means of the hook or pivot bolts, to prevent the wear and chafing of any stationary confinement—also, to be at liberty to make each bolt do its share of labor assigned, for castings are most invariably too uneven to get any equality of confinement in other modes.

116. Sewing Machines; Samuel Comfort, Jr., Morrisville, Assignor to self and F. H. Jackson, Philadelphia, Pennsylvania.

Claim—The guard, in combination with a bent needle, the inner edge of the said guard being in juxtaposition with the needle, and forming the segment of a circle of which the centre of vibration of the needle arm is the centre, for the purpose specified. Also, causing the needle thread to maintain the needle in proximity to the guard, and at the same time so guiding the thread to coincide with the groove of the needle, by means of the projection, arranged on the said guard.

117. Skeleton Hoop Skirts; R. J. Mann, Assignor to L. A. Osborn and J. J. Vincent, Brooklyn, N. Y.

Claim—In the construction of ladies' skeleton skirts, the combination of a series of horizontal hoops, adjustable in diameter with the bands or cords crossing and connecting them.

118. Dredging Crane; George Wood and John King, Assignors to selves and Wm. Lawrence, Philadelphia, Pennsylvania.

Claim—1st, The post with its pulley, and the barrel with its clutch, when arranged for joint action on the deck of the vessel, substantially as set forth. 2d, The carrier, with its pulley and its hollow stem, as arranged to turn in the socket in the end of the jib, in the manner specified.

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119. Washboards; John Adams, Pittsburgh, Pennsylvania.

Claim—A washboard having its rubber composed of glass, as described.

120. Bomb Lance; A. F. and J. H. Andrews, Avon, Connecticut.

Claim—The employment of the independent movable fuse tube arranged within a bomb lance, substantially as described, so that the fuse will be ignited by the motion of the missile.

121. Knife Sharpener; Alexander Annan, City of New York.

Claim—The two cutter plates with cut or corrugated surfaces, placed in oblique positions relative with each other, and arranged or fitted between the upright plates of a base, substantially as set forth.

122. Infants' Cradle; Thomas C. Ball, Keene, New Hampshire.

Claim—The arrangement of the cranks, C C, pieces, D D, slot, E, and cross-bar, F, in combination with the spring and gearing.

123. Safe Lock; Obadiah Bayly, Jr., Dearborn Co., Indiana.

Claim—The action of niche wheel in preventing the bolt, B B, from being passed back so as to unlock; the application of a movable pinion on the shaft wheel, in connexion with a steel plate and hand, by means of which the lock is set to unlock at any given hour by the niche passing in front of the bolt, B B, and permitting it to pass within the niche, and not until then. Also, the application of security spring, security lever, and security catch, in allowing bolt, B B, to pass back and over the rim of niche wheel, and again securing it opposite the rim of niche wheel when the door is shut. Also, the application of stop levers in stopping the clock when the niche is opposite bolt, B B, by lever, S S, coming in contact with the cogs of wheel of the clock. Also, the application of spring, L, in pressing bolt, B B, against the plate of the works.

124. Lath Machine; Josiah Black, Memphis, Tennessee.

Claim—The vibrating table and lever, B, together with mechanism connected therewith for giving change

of motion to carriage, in combination with the lever, B′, and the mechanism for opening and closing the dogs.

125. Bee-hives; Asa Blood, Sr., Norfolk, Virginia.

Claim—The main or breeding core, B, in enclosing case, in combination with the honey cores, D, in cap, E. the several parts being constructed in the manner specified.

126. Machine for Making Spoons; J. P. Brinkerhoff, Brooklyn, New York.

Claim—The arrangement and combination of the rolling die, E, die, G, bolster, F, opening, h, and bar, H, as described.

127. Electro-Magnetic Fire Alarm Apparatus; Moses G. Farmer, Salem, Massachusetts.

Claim—1st, The dial, the snail, and the key or lifting piece, A 2, in combination with an electric circuit and with the means of making and braking the circuit, for the purpose of striking a definite number of blows upon one or more bells, and of repeating the same, and of registering or indicating the number of the blows so struck. 2d, The arrangement of the circuit lever, l, the lifting piece, A 2, and pin, i 2, so that the circuit shall be closed on the dropping of the lifting piece from off the pin. 3d, The arrangement of the circuit lever, e, rack, w, whereby the circuit is completed by the falling of the rack, and broken when the required number of blows has been struck. 4th, The combination of the circuit levers, l and e, operating in the manner substantially as set forth. 5th, The arrangement of the arm, f, the arms, a and b, or their equivalents, for the purpose of effecting electric communication alternately with the time magnet, D, and the tracing magnet, H.

128. Shoe Peg Machine; Azro Brown, West Waterford, Vermont.

Claim—1st, The combination and arrangement of the radial and slotted plate, t, eccentric helical or spiral edged plate, between which and the lower plate, e, it is confined; said lower plate having depressions and gutters in its upper surface for receiving corresponding parts formed on the lower surface of the slotted plate, and a raised or ridged portion nearer its centre, whose inner edge corresponds with the eccentric curvature of the edge of the plate, the said slotted plate and the other parts mentioned being arranged in the manner set forth. 2d, Giving an intermittent progressive motion to the slotted plate, by the combination of the ratchet notches on its under surface, spring pawl, K, and oscillating lever, l, attached by a connecting rod to the pitman rod. 3d, Forcing or conveying the strips of wood from which the pegs are formed after being cut from the block or bolt, by means of the combination and arrangement of the traversing bars guided by wheels on the end of the cross-head, at the angle where they are connected, curved groove, v, in the drum, P, and knives, w, between which the strip is first deposited and subsequently conveyed through the slot in the rim of the plate or rim, and under the V-shaped cutter. 4th, The combination of the cylindrical knife and cutters, as described.

129. Devices for Saving the Seed from Hay fed to Stock; R. A. Campbell, Salem, Indiana.

Claim—The combination of the inclined conductive passage, intermediate hay rack, and sieve bottom trough, substantially as set forth.

130. Mode of Connecting Electro-Magnetic Apparatus with Tooth Forceps; J. J. Clark, Philadelphia Pennsylvania.

Claim—The employment of the foot-key, or its equivalent, in combination with the electro-magnetic machine and forceps, arranged as described.

131. Billiard Table; H. W. Collender, City of New York.

Claim—The manner of applying steel springs as cushions to billiard tables, by clamping the lower portion thereof to the edge of the bed. Also, making the height of the cushions above the bed of the table, adjustable, that they may be adapted to balls of different diameter. Also, combining with the bed and cushions, a flanch or ledge outside of the cushions on a level with the bed, or nearly so, to form a rest for the hand when playing with the ball near to the cushion, as set forth.

132. Power Looms; John Crawshaw, Rochester, New York.

Claim—1st, The lever, applied in combination with the cloth roll and with the spring of the take-up lever, to operate substantially as described. 2d, The rock beam, its arm, and pawl, applied in combination with the ratchet wheel, screw, and lever or levers, and weight or weights, to move said weights toward the fulcra of the friction strap lever, as the quantity of yarn on the yarn beam is reduced.

133. Sealing Preserve Jars; R. M. Dalby, Mount Washington, Ohio.

Claim—The yoke or ring, in combination with the leather, or its equivalent, as applied to vessels, substantially as described.

134. Burning Coal Dust; G. B. Deppen and E. Devengood, Myerstown, Pennsylvania.

Claim—In combination with a fan-blower to promote combustion, the arrangement of the fire chamber, ash-box, perforated plates, combustion and exit chambers, communicating with each other and with the air trunk leading from the fan-blower.

135. Safe Lock; Leger Diss, Utica, New York.

Claim—The combination of the reciprocating stop-holder with the levers, stops, and the compound slotted tumbler, the construction being as described.

136. Vault Light; Cornelius Donaldson, City of New York.

Claim—The annular flanch on each glass, in combination with the supporting plates and the ring packings of rubber, or equivalent material, in substantially the manner specified.

137. Vegetable Cutter and Coffee Mill Combined; B. Essig, Pittsburgh, Pennsylvania.

Claim—The mode of arranging and combining a vegetable cutter and a coffee mill in such a manner that by means of the sliding shaft, either of the two may be set in or out of gear.

138. Straw Cutters; Wilson Green and Malcolm McFisher, Chattanooga, Tennessee.

Claim—The arrangement of the treadle, leather strap, the regulating board, and knife, combined with the double-leafed lever, C, lever, E, and upright standard, for joint operation, as described.

139. Hand Hammers; Alfred Gregory, Washington City, D. C.

Claim—The heft regulating "hammer shaft" or helve, operating to secure to the implement, of which it forms the handle, an enlarged and variable capacity to deal light or heavy blows, as required.

140. Astronomical Instrument; Henry Glover, City of New York.

Claim—1st, The use of the double reflectors or mirrors, in combination with a vertical sight, whether

the said mirrors are fixed or made adjustable. 2d, The second graduated arc, in combination with the main instrument and with the second mirror, in the manner set forth. 3d, The supplemental arc, in combination with the level and with the main instrument, in the manner set forth.

141. Centre Boards for Vessels; Jesse F. Potts, Apalachicola, Florida.

Claim—The two or more hinges or parallel bars, when arranged in the manner set forth.

142. Binding Attachment to Harvesters; Wm. Gray, Nicholsville, Ohio.

Claim—1st, The arrangement of gravitating platform and series of levers with their accessories, in connexion with a drive wheel for the automatic starting of the binding mechanism by the weight of the sheaf or gavel. 2d, In this connexion, the talons, constructed and operating substantially as set forth. 3d, In combination with the talons, or their equivalents, the crane and its accessories, having the described compound movement. 4th, In the described combination with the talons, or their equivalents, the pliers, constructed as set forth. 5th, The rod, "looper," and "tucker-in," constructed as set forth.

143. Automatic Feed-boxes for Animals; Albert Goodyear, 2d, Hamden, Connecticut.

Claim—The arrangement of the box, lid, spring, and catch, with sliding plate, dial, notch, and button, united together in the manner set forth.

144. Harvesters; Stephen Hall, Poughkeepsie, New York.

Claim—Connecting the inside shoe to which the finger bar is fastened directly to the main frame, or to one or both the end bars of the main frame, by means of circular bearings at each end of the shoe, without any coupling piece, in combination with a small wheel hinged to the inside shoe. 2d, The notches, holes, or slots in the shoe and flanches near the bearings or joints on which the shoe turns, in connexion with the movable catches or bolts that work in them to keep the finger bar in its proper place, or from rising or falling too much over uneven ground, in combination with a jointed shoe, constructed as represented. 3d, I do not claim simply attaching a wheel of any kind to the inside shoe—but I claim the arrangement of the small wheel, with the jointed frame or bar hinged to the inside shoe, by which the wheel is allowed to remain in the same position when the finger bar is turned up to go from place to place, as it is when the machine is cutting grass, and the finger bar rising and falling over uneven ground.

145. Animal Traps; C. Jillson, Worcester, Massachusetts.

Claim—A rat or animal trap in which the jaws are moved from each other in a plane, and thus enlarge the opening between them, and which, when tripped, shall close up or contract the said opening, substantially as described.

146. Horse Power Draft; J. Herva Jones, Rockton, Illinois.

Claim—The combination of the levers and the flexible link, in the manner set forth.

147. Breast Pipes; Thomas Lewis, Malden, Massachusetts.

Claim—The described combined nipple shell and breast pipe, constructed by the attachment of a neck and pipe to an ordinary nipple shell.

148. Method of Registering the Speed of Railroad Trains; Charles T. Liernur, Mobile, Alabama.

Claim—1st, In the indicating apparatus, the governor, placed in the lower part of a casing, which can be used as a car seat, said governor having its weights so united by connecting rods and levers as to cause them to remain in their centrifugal and centripetal action, uninfluenced by any horizontal jars and shocks of the car. 2d, The compensation beam, or its equivalent, with its rods and levers, to bring over the motion of the cross-head of the governor to the indicator, so arranged as to cause the vertical jolts and jars received by the various moving parts to absorb one another, and the indicator which points out the degrees of speed on the index, the whole so arranged as to enable the passengers and conductors to be constantly informed of the exact speed of the train. 3d, In the registering apparatus, I claim the circular register of metallic or other paper, with its radiating and circular lines expressive of distance and speed, said register receiving any degree of retarded motion from the car axle by means of the worms, and the worm wheels, and the pencil-holder with its adjustable pencil, the whole so arranged that the various degrees of speed on all parts of the road shall be noted down on the circular register.

149. Telegraphic Instrument; Rufus Kendrick and Alpheus W. Arkerson, Cambridgeport, Massachusetts.

Claim—The application to the finger key of a telegraph instrument of a rocking shaft, or its equivalent, to which a succession of vibratory motions of the proper proportionate durations for producing the characters required is communicated. Also, the construction and arrangement of the rocking shaft with its dogs, and of the keys, operating in combination substantially as set forth.

150. Machine for Sawing and Planing Shingles; George H. Mallory, City of New York.

Claim—The particular means employed for adjusting the bolt to the saw, in order to give the taper form to the shingle, in combination with the means employed for adjusting or moving the planer to its work, to wit: the bars, connected as shown, by the pendant and set-screws operated by the wiper and pins, and attached respectively to the bar containing the jaws which hold the bolt, and the bar connected with the planer head.

151. Harvesters; James S. Marsh, Lewisburgh, Pennsylvania.

Claim—The arrangement of the bent lever and the arm of the caster wheel, when said lever is pivoted behind, and said arm is pivoted before the axle of the driving wheel, and the two are connected by the link.

152. Tongs for Coal, &c.; James M. Meschutt, City of New York.

Claim—The metallic tongs for coal fires, &c., constructed with fingers or curved prongs and the projections, for the purpose of preventing the fingers coming too closely together.

153. Hand Drills; Frederick McNair, Fultonham, Ohio.

Claim—The arrangement of the feed-screw, and sliding gate, and frame, in combination with the adjustable bed, as described.

154. Washboard; John Miner and Silas Merrick, New Brighton, Pennsylvania.

Claim—So impressing the corrugations equally upon both sides of the plate, that the medial or central line of the corrugated part of the plate may be in a line with the plane border, and that the ribs shall project equally on both sides, forming two equally good washing surfaces, as set forth.

155. Melodeons, &c.; Isaac Rehn, Philadelphia, Pennsylvania.

Claim—1st, The employment of independent wind chests in melodeons, harmoniums, and other similar reed instruments, in combination with the suction bellows, for the purpose specified. 2d, The introduction

of the stop valves between the independent wind chests and the bellows, in combination with the appliances described, or their equivalents, for operating the said valves, when the said appliances are situated within the bellows.

156. Churn; Harry and Royal V. Robie, Eaton, New York.

Claim—The perforated beater, in combination with the alternate beater, presenting a concave extremity in connexion with the passage formed by the narrow base of the beaters, the several parts being constructed and arranged upon the shaft with respect to each other, in the manner set forth.

157. Mould for Glass Bottles; Samuel S. Shinn, Lancaster, New York.

Claim—The mould constructed with its stationary portion of clay, plaster, or material of similar character, clamped between plates, and the opening portions of metal hinged to the upper clamping plate, substantially as set forth.

158. Forge Hammers; Benjamin Shiverick, Pittsburgh, Pennsylvania.

Claim—The cam, so constructed as to act on the collar opposite the spindle, or nearly opposite the spindle, during the whole time of its action in raising the hammer, except when the extreme end of the cam is passing out from under the collar to let the hammer drop. Also, a wedge, or its equivalent, so constructed and arranged as to be moved by the workman or attendant while the hammer is in motion, to graduate the action of the springs upon the hammer, to make it strike light or heavy blows, as desired.

159. Churn; Charles W. Stafford, Burlington, Iowa.

Claim—The general arrangement and adaptation of parts, substantially as set forth.

160. Breech-loading Fire Arms; John C. Symmes, Watertown Arsenal, Massachusetts.

Claim—The elastic flexible lip, substantially as described, however it may be applied to checking the escape of gas from the breech of breech-loading guns.

161. Machine for Moulding Boot and Shoe Soles; Daniel J. Tapley, Danvers' Centre, Massachusetts.

Claim—1st, Providing the lower former with a socket to receive the upper end of the wooden standard, and also with projecting ears to guide the rods and holes in the back flanch, to admit screws for confining the machine to a bench or the side of a shop. 2d, The combination of the spring, lever, and connecting guide rods, with the upper former, substantially as set forth.

162. Hame Fastener; John Tingley, Potter Co., Pennsylvania.

Claim—The combination of two hooks coupled together by a semi-revolving force plate, and the spring, the catch, and the projection, when made and combined substantially as set forth.

163. Ship-building; Daniel Vrooman, Hudson, Ohio.

Claim—The arrangement and combination of the inclined surfaces or projections, and the elastic fins or wings, with the hull of the vessel, substantially as described.

164. Locomotive Lamp Case; Irvin A. Williams, Utica, New York.

Claim—The combination of casings, B and C, with the chimney, A, the plates, p and p', alternating, and the construction and arrangement of the several parts, substantially as set forth.

165. Instrument for Trimming the Edges of Boot and Shoe Soles; Isaac Rich, Assignor to Samuel C. Arnold, Manchester, Connecticut.

Claim—The described instrument, consisting of the handle, guard, knife, and sliding gauge.

166. Spring Bed Bottom; Noah Warlick, Chambers' Court House, Alabama.

Claim—The wooden springs attached to the under side of the longitudinal slats, and resting on the transverse bar. Also, the use of metal or india rubber springs resting upon said transverse bar, for the purpose specified.

167. Braiding Machines; Andrew B. Clemons, Derby, Assignor to the Birmingham Iron Foundry, Birmingham, Connecticut.

Claim—Combining and arranging the tension and pawl blocks or weights, which have a rising and falling movement over the vertical guide bar in relation to the lower eye in the bar, E, and the bobbins, described, for regulating the paying out of the thread from the bobbin, and consequently its tension, in the manner set forth.

168. Machine for Cutting Bungs; James Lyon and George H. Brady, Assignors to selves and Thomas J. Falls, Jr., City of New York.

Claim—The cutters and stocks sliding in the adjustable blocks that are revolved by the face plate, and which cutters are projected by means of the disk, and act to cut a tapering bung.

169. Rails for Railroads; John Cochrane, City of New York.

Claim—The making or forming of such rails by means of rolls, with additional metal upon the crown or head thereof, which additional metal is forced into the head or top part of the rail by a second process, thereby consolidating the head or top part of the rail, and hardening the bearing surface thereof, substantially as described.

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170. Refrigerator; Abel H. Bartlett, Spuyten Duyvil, New York.

Claim—The wedge form and position of the ice and water receptacle, dividing the provision chambers, arranged as specified.

171. Sash Fastener; John Bostwick, Jr., Dedham, Massachusetts.

Claim—A sash fastener having an independent eccentric and an independent bolt, combined as described.

172. Truss Bridges; John C. Briggs, Concord, New Hampshire.

Claim—The application of india rubber, or equivalent springs, to the compressed joints of truss frames and truss beams, substantially in the manner described.

173. Devices for Clamping and Feeding the Bolt in Felly Sawing Machines; Derwin E. Butler, Chesterfield, Ohio.

Claim—1st, The bed, arranged with the rods and arms, connected by the bar and the spring, for the purpose of readily operating the bolt for feeding and removing the same from the saws. 2d, The jaw, formed on

the bent bar attached to the bed and spring, so that the jaw may be operated to grasp the bolt, and the bolt relieved therefrom by the movement of the bed, substantially as set forth.

174. Machine for Splitting Leather; Henry E. Chapman, Albany, New York.

Claim—The arrangement of the dished circular knife, the series of split springs, and the sliding bed, in their relation to each other, as described.

175. Apparatus for Heating and Ventilating Buildings; Wm. H. Churchman, Janesville, Wisconsin.

Claim—The arrangement and combination of the induction and eduction flues or venti-ducts, K K′, the continuation flue of the venti-ducts, K′, the damper, and the registered openings, whereby any number of the rarifying drums, with their accompanying venti-ducts, may be used at pleasure, either for warming or ventilating alone, or for both at the same time, as described.

176. Method of Regulating the Winding of Time-keepers; Jonathan Dillon, Washington City, D. C.

Claim—The described method of making springs or coils self-regulating, by the use of the slot and lever, or by any other similar device.

177. Blacksmiths' Tuyere; Benjamin E. Dixon, Marshall, Michigan.

Claim—The mode of regulating the length of the discharging orifice in a water tuyere, by means of the oblong tapered wind chamber, with grooves, or other equivalent device, in its casing, in combination with one or more of the tapered plugs, rods, and the detachable cover, to be used for the purposes described.

178. Chimney Caps; Charles Douglas, Cleveland, Ohio.

Claim—The frame, the valves, the cap, and the plan of linking the valves and cap together, to give them their proper relative positions, as described.

179. Machines for Breaking Stones for Ballasting Railroads and Turnpikes; A. C. Ellithorpe and Ives Scoville, Chicago, Illinois.

Claim—The cylinders constructed with a solid base and sectional shell, when the said shell is made in segments, and dovetailed and secured together, and dressed with teeth shaped and set as described, and when the said cylinders are used for breaking stone for Macadamizing or ballasting railroads, &c., substantially as set forth.

180. Picker Staff for Looms; Samuel Estes, Newburyport, Massachusetts.

Claim—The arrangement of the picker staff with the guide, with respect to the outer end of the passage, substantially as described.

181. Mode of Baking Articles Composed of Carbon; DeGrasse B. Fowler, City of New York.

Claim—The manufacture of articles from a composition of carbon and gas tar, or their equivalents, when treated with pressure and heat, and baked in the presence of lime, substantially in the manner described.

182. Gearing; G. B. Gansher, Reading, Pennsylvania.

Claim—The arrangement on the wheels, E and F, of the plates, A A′ A″, rollers or wheels, B B B, plates, D D′ D″, and collars, O O O, the whole being constructed and operating in the manner specified.

183. Straw Carriers; Carlos W. Glover, Farm Ridge, Illinois.

Claim—In combination with a series of bars having the motions described, the spring shield for aiding to guide the stalks or other thing conveyed thereon, and for preventing their falling back or becoming entangled.

184. Gearing; Ebenezer A Goodes, Philadelphia, Pennsylvania.

Claim—Providing the wheels respectively with spiral projections and spiral grooves, substantially as described.

185. Brick Moulds; James A. Hamer, Reading, Pennsylvania.

Claim—The two crank rods, or their equivalent, as connected with the followers and secured to the frame, and as operated upon by the hand piece.

186. Cooking Ranges; Joshua Harrison, City of New York.

Claim—The arrangement and combination of the flues, C and F; with the breaks or parts, G 1 and 2, substantially as described, and the dampers in connexion with the main flues, F F, directly underneath the fire, for the uses and purposes set forth. Also, the arrangement of the broiling grates with the flue, for the purpose of applying the heat of such fires directly to, and making it effective in, heating that part of the range most distant from the principal fire. Also, the construction and arrangement of the top plate, as described, by which the front and back rails are made a part of the body of the range, while the central part of such plate is made in separate sections, the back rail being also a base or foundation for the mason work, as set forth.

187. Cooking Stoves; Richard M. Hermance, Stillwater, New York.

Claim—The arrangement of the flue strips in the chamber, in combination with the fire-box, descending flues upon the sides of the stove, and oven flues under and back of the oven and exit pipe, arranged and operating together substantially as set forth.

188. Screw Wrench; Joseph Hyde, Troy, New York.

Claim—1st, The arrangement of the thumb-piece and the screw, in the manner and place described. 2d, Making the sliding jaw, E, in two equal parts, divided on a vertical line parallel with the bar, D, and the jaw, L, so as to cast the nut and the recess at the same casting of the said sliding jaw.

189. Inkstands; Orlando H. Jadwin, Carbondale, Pennsylvania.

Claim—In combination with a hollow plunger for raising the ink, an independent cup for holding said ink, and from which it cannot, by the ordinary want of tightness, flow back into the reservoir.

190. Tournures; Benjamin Johnson, Philadelphia, Pennsylvania.

Claim—A curved elastic projection or support, consisting of the springs and webbing, or their equivalents, when the said springs are constructed, arranged, and fixed to a waistband, so as to be held out thereby free from the under garments and person, as described, that they may operate in connexion with the webbing, substantially in the manner described.

191. Method of Neutralizing Local Attraction of the Needle; Calvin Kline, Brooklyn, New York.

Claim—Applying and arranging the magnet or magnets in a horizontal position or positions below or

above the needle of the compass, with opposite poles in the vertical plane of the axis about which the needle turns, and on opposite sides thereof, and in such a manner as to be adjustable on centres lying in, or as nearly as practicable in, the vertical axis about which the needle turns, that their poles may be made to point in any direction necessary to compensate for local attraction, and have such direction varied as may become necessary.

192. FURNACES FOR EVAPORATING SUGAR JUICE; Louis Lefebre, New Orleans, Louisiana.

Claim—In combination with the fluted outer surface of the kettle, forming the masonry constituting the opposite face of the flue with corresponding flutings or corrugations, so as to surround the kettle with an undulating passage for the products of combustion.

193. REFRIGERATOR; Adolphus Lipmann, City of New York.

Claim—The described arrangement of a series of coiled pipes which emanate from the ice chamber, and which are carried down between the two walls of the refrigerator to a central coil.

194. SMUT MACHINE; Hugh Marshman and Charles F. Foulke, Carlisle, Iowa.

Claim—1st, The combination and arrangement of the casing and funnel-mouthed opening, the parts being so arranged in relation to each as to, at the same time, give a converging descent to the grain, and an inward partially downward blast through it at that point 2d, The introduction of an auxiliary blast into the upper portion of the horizontal trunk, as described, by which a more perfect separation of the light grain is secured.

195. MOULDS FOR MAKING BOTTLES; John L. Mason, City of New York.

Claim—The combination of the screw thread with the rim, f, and also its combination with the rim, r, for the purposes set forth. Also, the combination of the grooves in the female screw of the mould, with the air passages through the mould, for the purpose set forth. Also, the blower-over, in combination with the moulds for the necks of bottles. Also, a flanch above the blower-over, as described.

196. ORE SEPARATOR; L. Stadtmuller, Bristol, Connecticut.

Claim—The apparatus described for sizing ores, constructed as specified.

197. SADDLE-TREES; Jesse Nece, Philadelphia, Pennsylvania.

Claim—1st, Rounding the under side of both the pommel and cantle of a wooden saddle-tree where they bear on the side pieces, and employing, in combination with the whole, the side strips, so that the said side pieces may be free to vibrate on their hinges, and still retain their proper relative position with regard to the pommel and cantle. 2d, The metal arch pieces secured to the pommel and cantle of the saddle-tree, as described.

198. FARM GATE; Wm. Newlone, Penn Yan, New York.

Claim—1st, The combination of the post and hinges, constructed as described. 2d, The chain, or its equivalent, with the means for adjusting the same, as specified. 3d, The catches and latch, combined with the means for actuating the same, as arranged in the specification.

199. PRESERVING SURFACES OF CAST OR WROUGHT IRON; Charles Francis Leopold Oudry, Paris, France.

Claim—1st, The employment of a varnish, or of successive varnishes, insulating, metallizing, and intermediary, between the object to be coated with copper—whether the same be metallic or non-metallic—and the protecting copper itself, all or a part of said varnishes being composed of certain metallic substances united with fat or essential oils, and gummy, resinous, bituminous, or asphaltic substances. 2d, The coating of all kinds of objects with copper, by the employment of one or several varnishes in succession previous to the galvanic coppering obtained directly in a bath of sulphate of copper, i. e., without the intervention of a bath of cyanide of copper.

200. BUSTLES FOR LADIES' DRESSES; George V. and Edwin A. Pierce, City of New York.

Claim—The springs, a a, fitted into a bishop or bustle, in combination with a lining or strap, forming a straight line of connexion between the ends of said springs, for the purposes set forth; and in combination with said springs, a a, fitted into a bishop or bustle in the manner specified, we claim the springs, c c, arranged and acting in the manner described. Also, the strap, f, or tape, in combination with the springs, a a, and bustle, substantially as specified.

201. GRATE BARS; Silas T. Savage, Albany, New York.

Claim—The employment of the bar, a, when provided with a series of flanches which form an arc above the bar, and which taper from the extremities of the chord of said arc, to or near the bottom of the bar, and thus supporting the coal in arches above the bar, and at the same time strengthening and sustaining the bar by the tapering sides of the flanches.

202. KNITTING MACHINES; Frederick Schott, Brooklyn, New York.

Claim—1st, The combination of the levers, G and H, the dog, G′, spring, k. sliding bar, I, adjustable stops, K′ K, and the eccentric, H′, or its equivalent, on the main shaft, the whole operating to effect the movement of the needle bed in one and the other direction alternately. 2d, The two-grooved safety guide, applied in combination with the feeder, to operate substantially as specified. 3d, The needle and stitch hook protector, applied as set forth. 4th, The combination of mechanism to operate the sinker or reliever, consisting of the cam on the main shaft, the arm and spring on the rock shaft, the spring applied to the reliever bar, the projection on said bar, the stationary inclined projection on the frame, and the stationary inclined planes, as set forth. 5th, The combination of the bar, X, or its equivalent, furnished with teeth, and a wedge-like projection, the pawl operated by the movement of the needle bed and the stop lever, the whole applied to operate in combination with a belt-shipper, to stop the machine as soon as any desired number of courses have been knitted.

203. MACHINE FOR PRINTING NAMES OR DIRECTIONS ON PACKAGES, &c.; James Spencer, Toronta, Canada.

Claim—The application of common type arranged in a form upon a plane bed, to the printing of successive names, numbers, or addresses, one at a time, upon papers, pages, books, tickets, or other articles requiring to be printed, marked, or addressed; and the construction of the machinery, as described, or any similar combination of machinery for producing the same motions, causing the bed to traverse so as to bring all the names, numbers, or addresses in the form successively under the aperture in the tympan, and causing the matter placed under the platen to receive the desired impression.

204. SEWING MACHINES; James H. Spencer and Thomas Lamb, Philadelphia, Pennsylvania.

Claim—1st, The vibrating or reciprocating carrier with its permanent projections, yielding projections, and spring-retaining catch, in combination with the shuttle plate, its casing and spool, when the several parts are constructed substantially as described, and when they are arranged in respect to each other and to the lip, as set forth. 2d, We do not claim, broadly, feeding the fabric by the combined vertical and lateral motion of a roughened surface feed bar on the said fabric, as such a device is described in the patent of A. B. Wilson,

granted December 19th, 1854. But we claim the arrangement of parts described, for feeding the fabric and regulating the amount of the feed, that is to say, the cams, spring rod, arms, the rod, its collar, and adjustable nut 3d. The cylinders, 3 and 4, with their resp ctive pins, when arranged in respect to each other, to receive the folds of the needle thread so that by turning one or both of the said cylinders, the pins may cause more or less of the folds to bear against the surface of the cylinder.

205. Wind Musical Instruments; C. J. Van Oeckelen, City of New York.

Claim—1st, The application to a musical instrument of several diff rent rows of reeds, combined in such a manner that each key of the instrument can produce several different sounds, by causing one or several reeds to vibrate according to the pleasure of the performer, preserving always, nevertheless, the proper musical expression of the note, in the manner substantially as described. 2d. The arrangement of the several parts in such an instrument by which the power is obtained of causing each note to vibrate on itself, and independently of all the others, in the manner substantially as described. 3d, The application to a musical instrument, the sounds of which are produced by the vibration of reeds of several rows of valves, so arranged as to act one upon the other, and that the valves of the different rows thus connected can be opened either all together or only one or more at a time by touching the same key of the instrument at the pleasure of the performer, preserving always, nevertheless, the proper musical expression of the note.

206. Manufacture of Sewing Needles; Henry Walker, Alcaster, Warwickshire, and Gresham Street, London, England; patented in England, May 19. 1858.

Claim—Forming the eyes of needles in the cylinder of the wire, without flattening the same, by means of the double grooves.

207. Threshing Machines; M. D. Wells, Morgantown, and Harrison Hagans, Brandonville, Virginia.

Claim—The combination of the bifurcated spikes of the cylinder with the peculiarly notched ribs of the concave, operating together as described.

208. Parasols and Umbrellas; Edward Young, Philadelphia, Pennsylvania.

Claim—The combination and arrangement of the stationary tube with the swivel rod, substantially as described.

209. Sewing Machines; H. W. Harkness, Assignor to self and W. H. Nettleton, Bristol, Connecticut.

Claim—Feeding the cloth to sewing machines by the combined action of a smooth reciprocating pressure foot and a vertical clamp, acting at the end of said foot to hold the cloth firmly while being moved, the bend or angle thus formed in the said material enabling the feed to act with but little pressure on the goods from the smooth foot-piece, as specified.

210. Grain and Fruit Dryers; Charles A. Haskins and G. Macardle, City of New York, Assignors to Joshua A. French and Eliza C. Tyrrell, Jersey City, New Jersey.

Claim—The traveling pipes and adjustable drums, and the form of the drums through which the hot air is compressed and distributed over and through the material to be dried. Also, the carriage and seats upon which the drums are adjusted, supported, raised, and carried, in combination with the pipe journal, gear wheel, and chamber.

211. Reclining Chair; A. E. Kendall and P. K. Keyes, Assignors to selves and C. W. Elton, New York.

Claim—In combination with the swinging post, jointed arm, and back, the employment of a serrated segment and fastening, constructed and operating substantially as set forth.

212. Locks; Wm. Moore, Brooklyn, New York, Assignor to G. L. Cameron, Chester, C. H., South Carolina.

Claim—As an improvement on my said patent of September 14, 1852, the check tumbler, and spring, in combination with the tumbler that is acted on from both key-holes.

213. Cooking Stoves; Gibson North, Assignor to North, Chase & North, Philadelphia, Pennsylvania.

Claim—The arrangement of the grooved back of the fire chamber, the cold air chamber in the flue, and the guard plate at the corner of the oven.

214. Sewing Machines; James Perry, Assignor to Isaac C. Noe, New York.

Claim—The combination and arrangement of the levers and cams for imparting the three reciprocating movements to the looper, namely, that in the arc of a circle, the lateral, and the vertical, in the manner described. Also, the shield, in combination with the looper and needle, arranged and operating in the manner described, for the purpose of presenting the loop to the looper with greater certainty.

215. Machine for Making Envelopes; M. G. Puffer, Assignor to Cyrus White and L. A. Corbin, Rockville, Connecticut.

Claim—1st, The shape essentially of the cams, for the purposes set forth. 2d, The employment of the jack, F, arm, C, operating as described, to paste and lift the paper, and the fly to separate it therefrom on to the carrier. 3d, The carrier, shaft, fingers, arm, stud, catches, and arms, for the purpose as described. 4th, The combined action of the bed with the plunger, for the purpose as described; also, the employment of the springs in the plunger. 5th, The folding flaps projecting from the centre, or nearly so, from the end of a shaft or shafts, and having their bearings on one end or on each end thereof, whether with or without the half circle. 6th, The construction and arrangement of the catch wheel with a long tooth and guard, for the purpose as described. 7th, The arrangement of the nippers, operating in the manner described.

216. Machines for Tarring Rope Yarn; John Stewart, Assignor to Charles Wall, Brooklyn, New York.

Claim—The employment within the tar vat of one or more series of sheaves or conductors over or round which the yarns are bent, in the manner described, to open their fibres, and make them pass and return in an opposite direction through the tar, for the purpose set forth.

217. Apparatus for Boring Wells; I. M. Butler, Oxford, Mississippi.

Claim—The square-chambered auger, constructed substantially as set forth.

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218. Kettles for Trying Oils; J. L. Alberger, Buffalo, New York.

Claim—A horizontally placed cylindrical boiler or tank surrounded by a steam-jacket, or having the steam admitted directly into it, when said boiler or tank is capable of being turned over in its cradle, and have all its contents run out at the man-hole—and this I claim whether said boiler be used in connexion with a condenser or without it.

219. CURTAIN FIXTURES; Thomas C. Baldwin, Newton, Massachusetts.

Claim—The detaching chamber and passage, in their combination and arrangement with the journal bearings of the two bearing blocks, and with the rotary friction ratchet, its spring and the pulley being arranged at one end of the curtain roller. Also, the arrangement of the rotary friction ratchet spring and the pulley at one and the same end of the curtain roller, or so that the said ratchet may turn on the journal projecting from the said pulley, in manner described.

220. TACKLE BLOCK; W. B. Barnard, Waterbury, Connecticut.

Claim—A tackle block having its bushing secured and adjusted to the pulley by means of a nut.

221. TOOL FOR CUTTING KEY SEATS IN WHEELS AND PULLEYS; James Barton, Cleveland, Ohio.

Claim—The employment of the shaft provided with a series of cutters which are adjustable, the two being so arranged that by pressing them through the hole or bore of a wheel or pulley, a key seat is finished parallel with the bore. Also, the employment of a tapering circular step or wedge between the cutter shaft and the bore of the wheel or pulley on the opposite side from the cutters while the key seat is being cut, for the purpose of cutting a tapering key seat.

222. SEED PLANTERS; James F. Beckwith and Adin G. Gage, Alabama, New York.

Claim—1st, The combination of the raising lever, when arranged with the marking wheel. 2d, The combination of the cranks on the axle of the marking wheel, when arranged with the markers, whereby the exact positions of the measuring recessess in the seed deliverer are indicated to the driver.

223. PIPE TONGS; James R. Brown, Boston, Massachusetts.

Claim—In the crossed lever jaw pipe tongs, the arrangement and application of the adjusting screw with reference to the fulcrum pin, the slot, and the hooked jaw lever.

224. PHOTOGRAPHIC PLATE SHIELD; Henry Bryant and R. D. O. Smith, Washington City, D. C.

Claim—The application of the bent wire, or its equivalent, for the purpose of opening and closing the door on the inside of the camera, in the manner described.

225. SCISSORS; Joel Bryant, Brooklyn, New York.

Claim—The exclusive use of scissors when provided with a spring or springs connecting with the rivet and blades, substantially as described.

226. APPARATUS FOR ASSORTING EGGS; Henry Burt, Newark, New Jersey.

Claim—The arrangement of the perforated surface, for receiving the eggs and excluding the light. Also, the mirror, in combination with the above, arranged substantially as specified.

227. FIRE ENGINES; Lysander Button and Robert Blake, Waterford, New York.

Claim—Placing the cylinders diagonally to the line of the rock shaft, in the manner set forth. We do not claim contracting the air vessel at its base or its point of attachment to the water ways or channels of fire engines. But we claim combining with the horizontal water way or channel, the air chamber, divided into two compartments by the contraction at or about one-half the height of said air chamber above its base or point of attachment to said water way. Also, in combination with the hour glass contraction of the air chamber, the ring enlargement of the rock shaft, as set forth.

228. EXTENSIBLE LIFE RAFT; Calvin Furbush, Kittery, Maine.

Claim—The combination of the diagonal braces, sleeves, and guide bars, with the tubular floats, in the manner set forth.

229. SEWING MACHINES; S. S. Burnet and Wm. Broderick, Chicago, Illinois.

Claim—1st, The employment of the rocker, in combination with the cranks of the driving shaft, and the needle bar or slide for giving the required motions to the needle bar to accomplish the formation of the loop, and simultaneously allow the shuttle time to pass through the loop before the loop is drawn tight, and thereby accomplish the interlocking of the two threads, and the drawing of the stitch tight on the cloth. 2d, The employment of an auxiliary adjustable thread guide, in combination with the rocker and stationary thread guide, for the purposes of governing and adjusting the amount of thread for each stitch. 3d, The employment of the segment friction plate hung on a horizontal axis with or without index pointer, in combination with the thread guides, for the purpose of causing a greater or less tension upon the upper or needle thread. 4th, The employment of a vertical sliding unyielding pressure bar, formed of two pieces, which are right and left screw-tapped, and coupled together by an adjustable link nut, in combination with a jointed, pivoted, feeding and holding-down pad, and a vertically and laterally-acting cam of the rocker, in the manner substantially as specified.

230. HARVESTERS; Nicholas Clute, Dunnsville, New York.

Claim—The construction and arrangement of the several parts, for the purpose of allowing the ends of the rakes to pass over and around the reel, in the manner specified. Also, the pulley when arranged to tip or vibrate the rake teeth at the top of the inclined plane, and release the grain and straw, and let it fall into the trough or box.

231. CUT-OFF VALVES FOR STEAM ENGINES; J. M. Colman, Milwaukie, Wisconsin.

Claim—The arrangement and combination of the flap valves, valves, jointed toes, rods, levers, and governor, as described.

232. PUMPS; Asahel Cooley, Springfield, Illinois.

Claim—1st, The parts composing the piston and its valves, when combined with the hollow piston rod, as described. 2d, The parts, H K and I, constructed as described, when combined with the hollow piston rod.

233. HOSE COUPLING; James C. Cooke, Middletown, Connecticut.

Claim—The female parts in combination with the male parts, arranged for the purpose specified.

234. ARRANGEMENT OF CUTTERS FOR TURNING HUBS; George Cooper, Berlin, Wisconsin.

Claim—The arrangement in the same machine of the adjustable preparatory and main cutter stocks, furnished with suitable cutters, in combination with any ordinary turning lathe or revolving centering shaft.

235. MODE OF SECURING THE ENDS OF RAILWAY BARS; Christian E. Detmold, Orange, New Jersey.

Claim—The mode of joining rails at their ends to form continuity thereof, without the use of chairs or plates, bolts or rivets, or of any other fastenings, by inserting iron joint pieces of such shape as to fit into slots in the shanks of two contiguous rail ends, and at the same time afford a support to the head of said rails,

whereby the rails are permanently kept in the same vertical and horizontal planes, and are allowed to expand and contract, substantially as set forth.

236. Ash and Garbage Safe; William Gee, City of New York.

Claim—The combination in a close case of the two chests, with rollers and arms extending from foot attached to the case, the top being ornamented; also, the mode of securing the said chests and case, as described.

237. Machine for Making Window-blind Slats; Isaac W. Gere, South Granby, New York.

Claim—A machine that will take a rough slat as it comes from the bolt, and automatically pass it along to and past the series of mechanical devices that will plane, dress, and form the tenons thereon, and complete the slat before it leaves the machine.

238. Furnaces of Steam Boilers; F. P. Dimpfel, Philadelphia, Pennsylvania; patented in England, May 24th, 1856.

Claim—The passages through the water spaces entering the combustion chamber or extension of the furnace. Also, the means for providing for the perfect consumption of the finer particles of fuel and products of combustion, as set forth.

239. Steam Trap; Frank Douglas, East Liverpool, Ohio.

Claim—1st, The arrangement within the box of the horizontal cylindrical chamber, the two disk valves, with their interposed adjustable stem, the levers, and connexions of said levers, with the float. 2d, The spherical float guard applied within the box, and in relation to the inlet passages, as set forth.

240. Seeding Machines; Warren Drummond, Woodbridge, New Jersey.

Claim—The elastic rollers arranged relatively with the slides, to operate as set forth.

241. Blind Operator; L. N. Fay and Wm. Mason, West Warren, Massachusetts.

Claim—The spirally flanched plate and worm-wheel, when attached to the sill and used in connexion with the slotted bar, stop, and the slat-adjusting device formed of the arms, shaft, and spring, as set forth.

242. Hot Air Furnaces; John R. Fergusson, Brooklyn, New York.

Claim—The combination and arrangement of the various parts, as described. Also, the evaporation pan in the hot air chamber of the furnace, when made adjustable vertically, as set forth.

243. Device to Prevent Injury from Rupture of the Main Spring of Watches; David Bucklin Fitts, Holliston, Massachusetts.

Claim—The separation of the barrel and the main or other gear wheel of the train, so that the two can revolve independently of each other, and the application thereto of mechanism described, and termed a "reverse motion," as explained.

244. Sediment Collector for Steam Boilers; Hiram H. Havens, City of New York.

Claim—The vessel, a, fitted with a blow-off pipe, in combination with the rings, or their equivalents, presenting alternate horizontal edges and openings from the highest to the lowest water gauge or level, as specified.

245. Sewing Machines; Albert H. Hook, City of New York.

Claim—The combination of the levers, arm, spring, and cam, constructed as set forth.

246. Seeding Machines; R. W. Hunt and M. Kennedy, Galesburg, Illinois.

Claim—Arranging the levers and plates which form the dropping device with the levers in the tubes, as described, whereby the above named parts are rendered capable of being operated simultaneously by the simple action of the bars on the ends of the levers.

247. Shutter Fastener; John McGerrah, Philadelphia, Pennsylvania.

Claim—The application of the brace to the under leaf of an ordinary hinge, and the nut as a continuation of the axis of the segment on which revolves the upper leaf of the hinge, which is secured by the brace and the pin securing the embrace of the brace and nut.

248. Supporting Insulator for Lightning Rods; N. N. McLeod, St. Louis, Missouri.

Claim—So cutting the groove in the edge of the glass as to form the elliptical body shown at A', fig. 1, whereby the insulator is attached to the building, in the manner described. Also, the combination of the two straps with the glass, and with the pointed conductor, constructed in the manner set forth.

249. Printing Press; David E. James, Utica, New York.

Claim—The arrangement and combination of the leverage through which the operations of the press are performed, including the use of the spring which permits the extension of the lever, q, while the carriage is at rest. Also, in combination with the said arrangement of leverage, the swinging post, and its connexion with the lever, o, as described.

250. Pumps; A. L. Keeports and George Palmer, Littlestown, Pennsylvania.

Claim—The combination of the main pump with the reservoir and ascension pipe, elastic spring valve, the whole arranged in relation to the proportions existing between the valves and pipes, operating as described.

251. Corn Planters; David Ladd, Dearborn, Michigan.

Claim—The peculiar arrangement of the frame, shafts, axle with cavities, wheels, box, ploughs, tubes, scrapers, and rod attached to axle, c, as described.

252. Seeding Machines; Daniel and Austin S. Markham, and David Eldred, Monmouth, Illinois.

Claim—The arrangement of the rotating shaft provided with distributing wheels having buckets attached, the slide bar, the plate, and adjustable strips or bottom, whereby seeds may be planted from the same seed box, either in drills, check rows, or broad-cast, as may be desired.

253. Preservation of Flesh for Food; Nathan B. Marsh, Cincinnati, Ohio.

Claim—1st, Preparing carcasses for injection, and injecting the same, in the manner set forth. 2d, The injecting or transmitting of the saline solutions at a temperature below or above the freezing point, or thereabout, as set forth, so that the flesh may be cooled from within outward 3d, Injection of portions of the carcasses, as well as the whole beast, with the solutions indicated, in the manner set forth.

254. Screw-neck Bottles; John L. Mason, City of New York.

Claim—A screw-neck or nozzle of a jar or bottle, in combination with a groove separating the thread from

the shoulder of the bottle or jar. Also, a screw on the exterior of the neck of a bottle or jar, in which the neck extends above the screw-thread, and the thread vanishes into the neck of the bottle or jar, as described.

255. GAUGE COCK; Richard L. Mills, Lancaster, Ohio.

Claim—The arrangement and combination of the lining tube and cap, containing the adjustable seats, with the double valve stem, as described.

256. APPARATUS FOR HOLDING SHEEP; S. Minnick, Hopewell, Ohio.

Claim—The adjustable couches, in combination with the neck piece and extension levers, arranged in the manner set forth.

257. VALVE GEAR FOR STEAM ENGINES; Edward Moran, City of New York.

Claim—Operating the valves by means of a valve guide, the movements of which are regulated by projecting cams. Also, the reversing apparatus, as set forth. Also, presenting and withdrawing the cams that give motion to the guide, so as to bring the cams into motion at the proper time to produce the desired valve motion, as specified.

258. VALVES OF STEAM ENGINES; Alden R. Morrill, Northfield, Vermont.

Claim—The arrangement of the valve case, its induction and eduction ports, with respect to the steam chest and the double-headed piston, made in manner to operate within such valve case, as described. Also, when the valve case is made tubular and open at both ends, making it separate from the steam chest, and so as to rest on the bottom of the latter, and confining it therein by means of screw-bolts extending through the top plate of the steam chest, and made to rest on the said valve case. Also, the arrangement of the safety valves and their conducting passages with reference to the double-headed or slide valve, in which arrangement the steam, in passing to the safety valves in order to raise them, does not pass through the double-headed piston or slide valve, but through passages arranged on the opposite sides thereof, as described.

259. MACHINE FOR CUTTING CURVILINEAR SURFACES ON ANGULAR PIECES OF WOOD; George Muller, Sacramento, California.

Claim—A convex plane bit, with edges beveling inward toward the centre, for cutting smooth chamfers of any shape on the edges of railing for express wagons, or on other pieces of wood, and the stand or rest connected therewith in the same machine by means of jaws movable in the frame; the rest or stand may be secured in any desired angle toward the plane to obtain a chamfer of any desired depth and bevel, and also of different shapes.

260. UNDER-DRAIN PLOUGHS; James and Edward Nevison, Morgan, Ohio.

Claim—The adjustable weighted roller, in combination with the plough and drags, as set forth.

261. AUGER FOR WOOD; Martin Norris, Broad Brook, Connecticut.

Claim—The attachment applicable to the common auger, bit, or other boring tool in use, and adjustable in the manner and in connexion with said auger or other boring tool, as specified.

262. SECURING THE ENDS OF RAILWAY BARS; John F. Peabody, Salem, Massachusetts.

Claim—The mode of constructing the chair and rails, the same consisting in making the said chair with the two reverse dovetailed recesses, and the rails with dovetails to enter such recesses. Also, constructing the dovetailed recessed flanch cap, with a projection extending below it, in connexion with making the base plate of the chair, with a recess to receive such projection.

263. LADIES' HOOP SKIRT; S. Peberdy, Philadelphia, Pennsylvania.

Claim—The combination of a spiral stay with the fabric which constitutes a lady's skirt, when said stay is formed by winding a flexible strip or rod made of one piece, or of a series of pieces spliced or united together continuously round the skirt from the bottom to the top of the body of the same.

264. VALVE GEAR OF LOCOMOTIVE ENGINES; Charles J. C. Peterson, Davenport, Iowa.

Claim—1st, Connecting the eccentric ring, from which the slide valve is operated, to the spring which rests on the journal box of the axle, on which the eccentric plate or cam fitting into said ring is fastened, so that the up-and-down motion of the axle has no influence on the motion of the slide valve. 2d, In combination with the eccentric ring attached to the spring, the arrangement of the cam in connexion with rods, and the rocking piece, whereby the slide valve is thrown wide open before the piston has accomplished one-quarter of its stroke, and which rods and rocking piece are so constructed that the motion of the slide valve may be reversed by raising the hook from one step of the rocking piece to the other one.

265. PASTING APPARATUS FOR BAG MACHINES, &c.; S. E. Pettee, Mansfield, Massachusetts.

Claim—Controlling the flow or draft of the paste when carried from a reservoir by a wheel or roll placed in a passage through the bottom of said reservoir, the roll receiving its motion from the passage of the paper under it, when said controlling is effected by means of the piece, D, and screw, E, in the manner described.

266. STEAM ENGINES; Rufus Porter, Washington City, D. C.

Claim—Furnishing steam engine cylinders with balance valves combined with lifting shafts, and so arranged that both induction and eduction valves communicate with the same port. Also, in combination with balance valves, arranged as described, so connecting the induction valves to a governor, by an arrangement of mechanism, that the said induction valve shall be so regulated by the governor as to admit into the cylinder such quantities of steam as shall be required to maintain a proper and uniform motion of the engine.

267. PUMPS; O. W. Preston, Jr., Corning, New York.

Claim—The employment of the elastic band, or its equivalents, serving to close the valves, and also as a means to keep said valves in place. Also, the construction of the piston with the concave cleft plate, in combination with the packing disks or rings, and double adjusting piston rod.

268. BRACE POST FOR FIELD FENCES; Cornelius Quackenbush, Huron, New York.

Claim—The arrangement of the supporting braces and connecting brace, pivoted together and combined with the fence sections in such a manner that the weight of the fence continually acts in firmly supporting and clamping together the sections.

269. HARVESTERS; Wm. and Thomas Schnebley, Hackensack, New Jersey.

Claim—1st, The arrangement and combination of the pendulous lever and slide with the scolloped wheel, as described. 2d, Securing the frame to which the finger-bar is attached to the main frame, by means of the universal joint and the bar fitted in the guide on the main frame, or an equivalent arrangement, so that the sickle may rise and fall bodily to conform to the inequalities of the surface of the ground, and at the same time be rendered capable of being placed directly over the main frame to facilitate the transportation of the machine.

270. Stop Gate for Canals, &c.; J. W. Sprague, Rochester, New York.

Claim—1st, The use of the revolving frames, and their combination with the cross timbers and with the planks. 2d, The use of the revolving lever in connexion with the check chain, as described.

271. Crimping Boot Soles; Bradford and Lorenzo Stevens, Stoughton, Massachusetts.

Claim—The crimper made of the bifurcated and grooved block, or its equivalent, and the holders applied thereto, as specified.

272. Corn Shelling Machines; G. W. Tolhurst, Liverpool, Ohio.

Claim—The combination of the spur-wheels with the levers or jaws, these several parts being constructed in the manner specified.

273. Straw Cutters; Peter Van de Sande, Assignor to self and Martin Vanderwerf, Rochester, New York.

Claim—Operating the feed rollers by means of the worm on the shaft of the cutter wheel, when combined with the adjustable feed gate, pressure plate, and weighted lever, for regulating the pressure of the feed, and preventing the choking of the rollers, and keeping the straw uniformly compressed at the point of cutting during the progress of the knife, as set forth.

274. Seeding Machines; John W. Vandiver, Shelbyville, Missouri.

Claim—The bars or rods pivoted within the said conveying tubes and having elastic plates attached, the upper ends of said bars or rods being connected with the vibrating plates of the seed distributing device, as set forth.

275. Propeller; Washington Van Dusen, Philadelphia, Pennsylvania.

Claim—The arrangement and combination of the frame, block, paddles, cranks, rods, and slots, substantially as described.

276. Apparatus for Hoisting and Storing Ice; H. Van Steenburgh and Joel Egnor, Catskill, New York.

Claim—The method of transporting ice upon inclined planes by carrying the ice up between parallel endless chains, having bars extended between said chains to hold the ice and propel the same—the planes being pierced with openings, for the passage of the ice to the successive stories of the ice-houses, and the propelling bars being so arranged that the descending bars shall not interfere with the free passage of the ice through the openings in the plane. Also, the use of the hatches described, to close the openings in the plane, in order to permit the ice to pass beyond a lower to an upper story of the ice-house, substantially as described.

277. Machine for Plating Nail Heads; Wm. H. Van Gieson, Newark, New Jersey.

Claim—1st, Combining the stop pawl, f', of the intermittently die table, J, with the dog, c, which give motion to the said table, by means of a link, f 3, applied to produce the operation of the dog, in combination with the pawl and the two series of ratchet teeth on the said table, to lock the table. 2d, The pair of receiving jaws with their cavity, to receive and retain the nail while they are closed, applied and operating in combination with the nail feeder and the intermittently rotating die table. 3d, The combination of a shaking apparatus for bringing the shells rim-upward, and a curved conductor for overturning them in their passage through it, to permit and ensure the deposit of the shells crown-upward in the dies. 4th, The combination of the pincers and the plunger in relation with the conductor, to take the shells therefrom and deposit them in the dies. 5th, The combination of the discharging plunger and the stationary hood, having a descending spout, with the intermittently rotating die table. 6th, The stop motion consisting of a feeding rod suspended from a spring-catch attached to the bar, which throws the machine in and out of gear, and operated by means of a cam on the main shaft acting on a spring connected with said rod, in combination with a stationary stop, or its equivalent. 7th, The arrangement of the nail-feeding apparatus, the shell-feeding apparatus, the shell-closing punch, the discharging apparatus, and the stop motion relatively to the intermittently rotating table, substantially as described.

278. Manufacture of Hard Rubber; T J. Mayall, Roxbury, Assignor to self and G. N. Davis, Boston, Mass.

Claim—The use of olive oil when incorporated with other materials in the manufacture of hard vulcanized rubber, as described.

279. Air Engines; H. M. Paine, Worcester, Massachusetts.

Claim—The simultaneous moistening and refrigerating of the air previous to its entrance into the pump, in combination with the modifying valve, substantially in the manner described.

280. Hinge for Window Blinds; Thomas E. Williams, Washington City, D C.

Claim—The catch bar and catch, in combination with the cavities and hinge, substantially in the manner described.

281. Cultivators; Wm. Wilmot, Wilmington, Delaware.

Claim—The arrangement and combination of the bars, G G 1, G 2, bars, H, adjustable weights, chains, bars, L, and handles, as described.

282. Machines for Distributing Guano and other Fertilizers; Elijah Wagner, Westminster, Maryland.

Claim—The combination of the stirrer and the feeder, operated in different directions and at different speed, the two being arranged in the manner specified.

283. Railroad Car Brakes; Asa D. Whipple, Elmira, New York.

Claim—I do not claim the manner of securing the armature to the shaft, by means of a loose collar and bar—but I do claim them in combination with the spring for a new purpose, viz: a mode of varying the intensity of the connexion of the armature with the shaft, and allowing that connexion to give way when the resisting force is sufficient to prevent the car wheels revolving and causing them to slide. Also, the method of communicating the motion of the car wheels to their brakes through the medium of electro-magnetism, consisting substantially of the spring jaws, and of the insulated rings on the axis of the magnet, arranged and operating in combination with the said magnet and adjustable armature, in the manner specified.

284. Hay and Cotton Press; Henry Barnes, Blairsville, Assigner to self and N. G. Macrum, Pittsburgh, Pennsylvania.

Claim—The arrangement and combination of the geared eccentric, inclined rack, and follower rod, substantially as described.

285. Restoring Waste Vulcanized Rubber; H. L. Hall, Beverly, Massachusetts, Assignor to the Beverly Rubber Company.

Claim—The method of restoring waste vulcanized rubber, by grinding it to a fine or powdered state, or

otherwise, then submitting the same in a close or proper vessel to the action of steam direct upon the rubber or in connexion with water for the space of forty-eight hours, more or less.

286. Sewing Machines; Charles Raymond, Brattleborough, Vermont, Assignor to Willford H. Nettleton, Bristol, Connecticut.

Claim—The arrangement of the adjustable rack having a reciprocating and vibrating motion, and operating in combination with the pinion and feeding wheel to regulate the feed, in the manner described. Also, the slide, u. carrying the looper, and provided with the slot, receiving the pin on the bar that is formed with the carrier for the second thread, whereby the thread carrier is actuated by the reciprocations of the looper, in the manner specified.

287. Weavers' Shuttles; N. J. Willis, Lawrence, Mass., Assignor to S. Chase, Brooklyn, New York, and G. A. Fuller, Lawrence, Massachusetts.

Claim—The manufacture of weavers shuttles, made of separate nose blocks and a hard rubber or indurated vulcanized caoutchouc shell or body, or equivalent, cast or moulded on the nose blocks, in the manner described.

288. Machines for Cutting Dovetail Mouldings; Solander Withington, St Louis, Missouri.

Claim—The combination of the saws, I′ I and J′ J, with each other and with the two saws, K′ K, in the manner described, the two saws, J′ J, being set in a diagonal plane. Also, adapting and arranging the carriage, C, with the described combination of saws, for the purpose specified. Further, the arranging of three saws, K′, I′, and J′, in the carriage, B, by which the machine is adapted to cut the different lengths of stile.

Disclaimer.

1. Vessels for Holding Liquids; James H. Stimpson, executor of James Stimpson; patented October 17, 1853; disclaimer dated November 16, 1858.

I disclaim so much of the first claim of said patent as may include the application of the double wall to other structures or vessels than ice pitchers.

Additional Improvements.

1. Method of Attaching Lamps to Lanterns; John Fleming, Pittsburgh, Pennsylvania; patented July 6, 1858; additional dated November 2, 1858.

Claim—The improved arrangement described, the same consisting in the attachment of the spring and clips to the lamp case, instead of to the lantern.

2. Propeller; Henry Link, Little Falls, New York; additional dated November 16, 1858.

Claim—The wings made up of a series of horizontal hinged valves graduated in width, as described, in combination with the cylindrical section, either hollow or solid.

3. Cotton Gin Feeders; Jedediah Prescott, Memphis, Tennessee, late of Rockford, Illinois; patented Oct. 13, 1857; additional dated November 30, 1858.

Claim—The endless apron, revolving adjustable toothed bar, rotary bush and toothed cylinder, and grating, combined as set forth.

Re-Issues.

1. Mode of Generating Heat; T. R. Hartell, Assignee of Wm. Hartell and Joseph Lancaster, Philadelphia, Pennsylvania; patented Nov. 23, 1852; re-issued Nov. 2, 1858.

Claim—The adaptation of, or rendering available, tar, as a fuel for the production of the intense and steady heat required for the melting of glass, and for other processes and manufactures, by introducing water or the vapor of water into a furnace or fire-place, in contact, combination with, or in close proximity to the tar, substantially as set forth.

2. Sewing Machines; I. M. Singer and E. Clark, Assignees of John Batchelder, City of New York; patented May 8, 1849; re-issued November 2, 1858.

Claim—The combination of mechanism, so that the cloth or fabric to be sewed being placed upon the machine will be automatically fastened on to the feeding apparatus, carried forward to receive the stitches, and discharged from the feeding apparatus, and so that seams of any desired length may conveniently be sewed.

3. Corn Harvesters; E. C. Manck and W. T. McGahey, Conrad's Store, Virginia; patented April 22, 1856; re-issued November 2, 1858.

Claim—1st, The rotary arms, p, in combination with eccentric guides, q, substantially in the manner specified. 2d, The employment of a double series of cutters, for cutting stalk and stump.

4. Furnace for Burning Bagasse; Elizabeth Ann Harris (late Stillman), City of New York, Administratrix of Alfred Stillman, deceased; patented May 1, 1855; re-issued November 9, 1858.

Claim—1st, The employment, in connexion with the boilers or other vessels of a sugar plantation which require heat, and with the mill for expressing the juice from the cane, of a furnace, constructed substantially in the manner set forth, capable of burning wet bagasse without the aid of other fuel than the bagasse itself, and capable also of utilizing thereby said bagasse as a generator of heat for said vessels. 2d, Combining the cane mill with a furnace, constructed as described, by means of the endless carrier.

5. Treatment of Caoutchouc; A. G. Day, Seymour, Connecticut; re-issued November 9, 1858.

Claim—Running the heat for vulcanizing flexible and elastic hard gum compounds, through the range of temperature, and the comparatively great length of time—that is to say, commencing the heat at about 275°, and carrying the same to 300°, and upwards. Also, making the flexible and elastic hard gum composition of two parts, by weight, of rubber or other vulcanizable gum, and one part of sulphur, when such composition is preparatory to the running of the heat, as described. Also, equalizing the temperature in the heating apparatus by mechanical means.

6. Automatic Steam Whistles in Locomotives; James Harrison, Jr., City of New York, formerly of Milwaukie, Wisconsin; patented April 1, 1856; re-issued November 9, 1858.

Claim—1st, Giving audible indications of the approach of the train of cars to persons at the stations or other points on the route, by an arrangement of means interposed between the truck wheels and whistle, and which are actuated by the truck wheels. 2d, Combining with the means of giving audible indications, other means for giving visible indications to persons charged with the care of the train, both sets of means being

actuated by the truck wheels. 3d, Varying and modifying the tones or sounds of the whistle by the form and surface of the lifters and their arrangement and position upon the cylinder.

7. Stoves; Joseph C. Henderson, Albany, New York; patented May 18, 1858; re-issued November 9, 1858.

Claim—The new radiating combustion chamber with a conducted orifice or throat producing a plenum in said chamber, in combination with a fire-box or pot, and with an exterior chamber surrounding said combustion chamber, and from which exterior chamber the heat is taken by radiation or conductor, substantially as set forth.

8. Seed Planters; Jarvis Case, Bloomington, Illinois; patented January 16, 1855; re-issued November 16, 1858.

Claim—In combination with a corn planting machine that is constantly moved over the ground, and drops the grain intermittently, the so combining of two slides, one of which is at or near the seed hopper, and the other at or near the ground, or their equivalents, with a lever, as that the operator or attendant on the machine can open said slides at the proper time to deposit the seed, and prepare a new charge by the double dropping, as specified.

9. Printing Press; George P. Gordon, City of New York; patented June 13, 1854; re-issued November 16, 1858.

Claim—Relieving the sheet from the type, and taking the sheet directly from the platen, or either of them, with or by the same nippers, which shall carry such sheet to its place of deposit or piling. Also, giving, with one inking cylinder, two distributions to the inking rollers for each impression, viz: one distribution prior to passing the form, and one distribution prior to the return of the form to its first position. Also, the arrangement of the spring, connecting rod, crank, and stops, as described, to operate the bed and give the necessary dwell for the impression.

10. Grinding Mills; Edward Harrison, New Haven, Connecticut; patented June 6, 1854; re-issued November 16, 1858.

Claim—The method of securing the runner stone on the driving spindle in a grinding mill, by means of a metallic band, or its equivalent, embracing the periphery of the stone, by combining said band with a hub, and a back plate of at least as great diameter as the runner, and rigidly attached to the spindle, such combination operating to secure the stone firmly in its place.

11. Wood Screws; The Eagle Screw Co., Assignees of Thomas J. Sloan, Providence, Rhode Island; patented August 20, 1846; re-issued November 23, 1858.

Claim—1st, Making the core with a conical point, in combination with the body of a cylindrical form, or nearly so. 2d, Making the core with a conical point, in combination with the thread formed on such conical point of a gradually less depth as it approaches the apex of the core, and with the several convolutions on the body, at equal distances apart. 3d, Making wood screws with the core or a conical shape along that part of the length of the screw extending from where the thread begins on the shank, to where it becomes of full depth. 4th, Making wood screws with the core of a cylindrical, or nearly cylindrical, form, and with a conical point, in combination with the thread of equal pitch along the conical point and body, that is, with all the convolutions at equal distances apart, and of gradually less depth from the base to the apex of the core.

12. Reducing the Friction of Journals of Axles on Railways; J. K. Denning, City of New York, Assignee of Leon Joseph Pomine De Mirimondi, Paris, France; patented August 23, 1856; re-issued November 23, 1858.

Claim—The arrangement for the semi-boxes for resting on the journals of the friction rollers within the upper part of the main part of the main journal box, and entirely enclosed within the said main box, in combination with the axle journal on which the rollers rest to sustain the load. Also, taking the lubricating matter from the looser part of the main box, and applying it to the journals of the rollers by the projections at the ends of the axle journals. Also, the method of lubricating the journals of the rollers, and the periphery of the axle journal and the rollers, by the projections on the axle, which in rotating take the lubricating matter from the reservoir in the main box, and apply it to the journals of the rollers above, that the drippings therefrom may lubricate the periphery of the rollers and axle journal, substantially as described.

13. Watch Cases; Elihu Bliss, Newark, New Jersey; patented April 13, 1856; re-issued Nov. 23, 1858.

Claim—Arranging the push piece which passes through the pendent, in combination with the pin, and so as to operate the spring catch to the closed bizzle of the outer case, when the face of the watch is in either position, as set forth. Also, arranging the case of the watch which contains the movement, and which carries the dial within a surrounding ring or rim, so that it can be turned within the said ring and in the plane thereof. Also, arranging the journals by which the body of the watch is attached to an outer case, and on which it turns reversed, so as to leave the works of the watch free to be shifted in its surrounding ring, substantially as described.

14. Saw Mills; Hazard Knowles, City of New York; patented Sept. 28, 1852; re-issued Nov. 30, 1858.

Claim—So guiding the movements of the saw as to cause it to advance in the line of its plane as it descends, for the purpose of properly distributing amongst the teeth of said saw, the cutting action which may be exerted thereby upon the material operated upon. Also, arranging the ways of the saw gate in such a manner with relation to the feeding apparatus, that the amount of feeding movement imparted to the carriage will always be in perfect harmony with the amount of cutting action exerted by the saw. Also, arranging the compound parts of my improved saw mill, in such a manner that the amount of cutting action exerted by the saw can be speedily varied whilst it is in motion, from its maximum performance down to nothing, and vice-versa.

15. Churn; James Macnish, Berlin, Wisconsin; patented April 20, 1858; re-issued Nov. 30, 1858.

Claim—Expressing the butter from the globules or sacks of milk or cream by friction, such as rubbing, washing, or grinding, when accomplished in any manner equivalent to that specified.

16. Felting for Coats, Hats, &c.; M. Osborne, City of New York; re-issued November 30, 1858.

Claim—The method of manufacturing articles of wearing apparel, of which wool or other similar animal fibre constitutes a larger part, as set forth.

Designs.

1. Stoves; E. J. Cridge, Troy, New York; dated November 2, 1858.
2. Statues of Henry Clay; T. Ball, Boston, Massachusetts, Assignor to G. W. Nichols, City of New York; dated November 9, 1858.

3. Stoves; L. D. Thomas, North Dighton, Massachusetts, Assignor to the Dighton Furnace Company; dated November 9, 1858.

4. Hat and Cane Stand; Edward Reynolds, Assignor to Thomas W. Brown, Boston, Massachusetts; dated November 16, 1858.

5. Cooks' Stove; A. C. Barstow, Providence, Rhode Island; dated November 16, 1858.

6. Script Type; James Conner, City of New York; dated November 16, 1858.

7. Stove Plates; Samuel D. Vose, Albany, New York; dated November 23, 1858.

8. Iron Fences; Edwin Gomez, City of New York; dated November 30, 1858.

DECEMBER 7.

1. Cooking Stoves; Federal C. Adams and Joseph Peckover, Cincinnati, Ohio.

Claim—In combination with the smoke passages formed by the single vertical and inclined partition, arranged with regard to the exit aperture, as described, the admitting of air under the grate into the air spaces, and from thence into the smoke passages, by means of the perforations in the lip or flanch of the back lining plates of fire-box.

2. Extension Table; Adolphus Bader, City of New York.

Claim—The arrangement of additional plates in arms of such a shape and form that by drawing out the arms the plates are brought to a level with the top of the table. Also, confining these arms at the proper places by means of the notches and the hook, and to guide the same by means of pins and notches.

3. Sewing Machines; Robert M. Berry, City of New York.

Claim—The combination and arrangement of the feeding foot of cork, or its equivalent, with the peculiar feeding mechanism described, or its equivalent.

4. Sewing Machines; Hobert H. Bishop, Bristol, Connecticut.

Claim—The plate in slides on the needle bar at right angles to it, and carrying the eye-pointed needle, in combination with the bent lever and stops, or their equivalents.

5. Washing Machine; Jesse Bowen, Yellow Bud, Ohio.

Claim—The alternating rotation of the tub in one direction, and the similar rotation of the rubber in an opposite direction, by means of the levers, racks, and pinions, arranged as set forth.

6. Seed Planters; Jarvis Case, Bloomington, Illinois.

Claim—1st. Dispensing with side rails and connecting the front and rear truck by the driver's seat, hinged to the front truck, and rigidly secured to the rear one. 2d, The so arranging of a reversible marker upon the front truck of the machine, so that when planting the runner shall not touch the marker arm; but when said front truck is raised up to turn the machine around, the runner shall catch and raise up and hold up said marker. 3d, In the construction of the runner, the hollowing out for the marker arm, the forming of the seed ducts in the sides of the runners, and so inclining the straight edge thereof as that its heel shall be the lowest point.

7. Railroad Car Brakes; Henry E. Chapman, Albany, New York.

Claim—The arrangement of the shaft, L, having upon it the right and left-hand screw threads, the right and left-hand nuts, the rods, the levers, I I′, the shafts, H H′, the levers, G G′, and the cross-bar, in their relation to each other and to the brake, as set forth.

8. Burners for Lamps; M. B. Dyott, Philadelphia, Pennsylvania.

Claim—Regulating the light of a gas lamp by raising and lowering the heater and pin connected to it, while the head of the burner remains stationary. Also, in combination with the heater and burner, the valve or projection on the one, and the valve seat on the other, when the said valve and seat are located between the top of the wick and the openings at which the gas is burned.

9. Machine for Cutting Staves from the Bolt; Isaac W. Forbes, Jefferson, Wisconsin.

Claim—The arrangement of the hinged platform and its latch bolt in such a manner with relation to the concaves and the knife of the cutter head, that the said parts can be operated substantially in the manner set forth.

10. Horse Rakes; Christian Garver, Londonderry Township, Pennsylvania.

Claim—The arrangement of the cross-piece, staples, parallel arms, slots, and pins, with rake, in the manner specified.

11. Corn Harvesters; Bronson Murray, Ottawa, and John Van Doren, Farm Ridge, Illinois.

Claim—In combination with the inclined knife or cutter, the curved guides or arms, for bending over and thus facilitating the cutting. Also, in combination with the stationary cutter, the reciprocating cutter, when operating together in the manner set forth. Also, in combination with the cutting and guiding or directing apparatus for severing and dropping the stalks, the shovers for moving them rearward. Also, the arranging of the conveying apron upon removable supports, and so inclining it that it will convey the stalks over or past the opening, J, behind it, when used, but leave a delivery at J when removed.

12. Composition for Purifying Gas; Paul B. Goddard, Philadelphia, Pennsylvania.

Claim—The use of lime dissolved in a saccharine solution, whether combined or not with other substances.

13. Horse Rakes; John W. Hadcock and Parker Wilcox, Norway, New York.

Claim—The arrangement of the rake teeth with the metal point or shield, as described.

14. Washing Machine; John G. Haley, Isaac Wilson, and Jackson Lyon, Cameron, Illinois.

Claim—Making the spaces between the edges of the slats of the washboard of a width different from that of the spaces between the edges of the slats of the cylinder, and allowing the slats of each to interlock or mash and slip upon each other, for the purpose of causing the clothes to move or change their position in the wash-box whilst they are undergoing the rubbing process.

15. Harvesters; Henry Opp, Belleville, Illinois.

Claim—The employment of the plate, operated as described, in combination with the bar, J, or its equivalent, attached to the finger-bar, G.

16. Wrought Nail Machine; Adrian V. B. Orr and Gideon Bantz, Frederick, Maryland.

Claim—1st, The dies, constructed in the manner described, and when acting simultaneously, in combination with the heading swage upon the heated bar. as specified. 2d, With the said header and dies, the use of the elongated tweer, opening in the manner set forth.

17. Lime-kilns; Clark D. Page, Rochester, New York.

Claim—The construction of the cupola with the sectional form shown in fig. 2, combined with the arrangement of the flues, as described.

18. Sewing Machines; Samuel F. Pratt, Roxbury, Massachusetts.

Claim—For interlooping two threads in order to sew cloth or other material, by means of an eye-pointed needle, or its equivalent, the combination of a thread carrier or adjuster and a hook, so acting together and with the eye-pointed needle, or its equivalent, as not only to cause the thread of the carrier to be laid or presented in rear of the needle in a proper manner to be seized by the hook, but to cause the hook to pass through the loop of the needle, seize the thread of the carrier, and next recede and draw the said thread in the form of a loop through the loop of the needle. and properly present it for the needle to pass through it during its next downward movement, after the cloth may have been fed along the length of the stitch. Also, the thread carrier constructed with the slit, or its equivalent, and barb. operating in the manner described, to present the lower thread to the reciprocating looper hook, which will draw it through the loop formed in the needle thread.

19. Method of Measuring and Recording by the Tape; E. A. Preston, Battle Creek, Michigan.

Claim—The described arrangement of a tape measure, whereby the same is made self-registering by means of the drum, the pawl, and the ratchet wheel, in combination with the spring arranged in the barrel, and with the pinions and the wheels.

20. Platform Scales; Elnathan Sampson, St. Johnsbury, Vermont.

Claim—The arrangement of the stationary frame, descending and sliding platform, rising frame. descending arm, and weighing beam, when the whole is combined by means of links and knife edge bearings, and arranged as described.

21. Amalgamator; Lewis Solomon, City of New York.

Claim—1st, The use of elongated amalgamating chambers, when arranged to operate in the manner specified. 2d, The arrangement of the amalgamating chambers within a heated chamber, for the purposes specified.

22. Water-proof Cork Composition; Andrew Stevens, City of New York.

Claim—Granulated cork that is covered and impregnated with the composition specified.

[By impregnating and coating granulated cork with a solution of a gum in alcohol and certain essential oils, it is rendered less susceptible of absorbing moisture, and better adapted to the purposes of filling the quilted linings of overcoats, jackets, mattresses, and other articles of a like character, intended for life-preservers; and also imparts to them a peculiar and pleasant odor, which is, however, so distasteful and injurious to bedbugs and other vermin, as to keep them entirely away from the articles so impregnated.]

23. Guard for Circular Saws; Reuben S. James, Bethel, Vermont.

Claim—The shield with blade arranged with or without tongue, for circular saws, operating substantially as described.

24. Burners for Lamps; Josee Johnson and Frederick Bailey, City of New York.

Claim—The combination in a lamp of the tubes, glass tubes, and barrel, in the manner set forth.

25. Grain and Grass Harvesters; M. G. Hubbard, Penn Yan, New York.

Claim—The attachment of the front corner of the reaping platform to the corner of the machine, by means of the hinge. constructed as set forth. Also, the elastic connexion between the reel and driving power, in combination with the flexible attachment of the outer reel arm. Also, the employment of the self-sustaining raising lever, when constructed as specified. Also, supporting a portion of the weight of the outer end of the platform by means of the spring, or its equivalent.

26. Sealing Preserve Cans; Allen Taylor, Baltimore, Maryland.

Claim—The forming of the gutter-shaped rim which supports the sealing cement of a porous or textile substance, said substance being applied to the downwardly bent edge of the cover, and forming with said edge a V-shaped gutter, in which the cement when melted will be confined, yet allowed to come in contact with the metal surface, and thus seal the cover to the can with a small expenditure of cement, and in such a manner that the cover can be readily unsealed without cutting up and wasting the cement, as when other modes of sealing are adopted.

27. Edge Keys for Boots; George C. Todd, Lynn, Massachusetts.

Claim—The shank, in combination with the disk so attached to the side of it that the angle of inclination of the disk to the shank may be varied as required.

28. Preventing Incrustation of Steam Boilers; John Warren Harnett, Cincinnati, Ohio.

Claim—The means and manner specified of injecting oil, or other fatty matter, in a liquid state, into the boiler, for the purposes set forth, whereby the said oil or other fatty matter is fed to the boiler simultaneously and in connexion with the water, as described.

29. Stoves; Charles Hartwell, Boston, Massachusetts.

Claim—In connexion with the evaporating vessel, or its equivalent, for supplying vapor to the air, the described arrangement of the parts of my stove, consisting of the fire pot, lower chamber, receiving pipe, tubes, and oven, or other cooking vessel, arranged in the manner described. And in connexion with the above, the aperture leading from the interior of the case to the ash pit.

30. Watch Cases; Auguste Lachat, City of New York.

Claim—The method of constructing a "magic" watch case, substantially as described. Also, making the head of the push pin movable, in the manner set forth.

31. Sewing Machines; John Mackenzie, Cleveland, Ohio.

Claim—Combining the lever-like feed dog with the revolving eccentric pin, which operates the shuttle by means of the vibrating, slotted, double cam-like plate, and the two levers, the connecting rod and the springs, arranged as described, to produce the movements of the feed dog.

32. Saw Set; Edward Marshall, City of New York.

Claim—The described method of setting saws, whereby the saw is firmly clamped and held in the slot by means of claws, while the tooth is being bent or set, the saw being alternately clamped and released as the teeth are successively set.

33. Furnace for Melting Iron; Wm. McFarland, St. Louis, Missouri.

Claim—The combination of a reservoir with a cupola furnace, so as to collect the metal as fast as melted, substantially as set forth.

34. Life Berth for Vessels; James P. McLean, City of New York.

Claim—The arrangement of the removable bed or bottom, canvass joints, lockers, oar and signal compartment, air tubes, and the projections, grooves, and plates, combined in the manner described.

35. Door Latch; Henry Hackman, Jr., Pequa, Pennsylvania.

Claim—The revolving bolt, the lever arms, peg, coiled spring, the shouldered shank, and spring catch, when combined as described.

36. Bustles; Charles A. Postley, Jersey City, New Jersey.

Claim—The combination of adjustable hoops and adjustable waist ribs, arranged in the manner described, so that the size of the bustle and the position of the hoops may be varied to suit the wearer.

37. Device for Supporting Furniture Casters; Henry E. Richards, Newark, New Jersey.

Claim—The arrangement of the concavity, A, and the points, D B B, substantially as described.

38. Saw Sets; I. P. Vanvleck, Cooksville, Wisconsin.

Claim—The hammer head operated from the treadle through the medium of the bar, springs, and arm, in connexion with the anvil and gauge, arranged substantially as set forth.

39. Mode of Opening and Closing Farm Gates by Approaching Vehicles; Caleb Winegar, Union Springs, New York.

Claim—1st, The combination only of two or more capstan rollers. 2d, The operating of gates by means of winding up the weight, or equivalent spring, with the wheel of a carriage, or by lever, each time in passing and re-passing the gate, sufficient to open or close the gate or gates.

40. Spindle for Throstle Spinning; C. E. Brown, Assignor to self, John Tenney, and John Rhodes, Millbury, Massachusetts.

Claim—The combination and arrangement of the stationary socket spindle, the loose spindle, and the reversed flyer and whir, when constructed in the manner described.

41. Billiard Table Cushion; J. E. Came, Assignor to self and James E. Came, Boston, Massachusetts.

Claim—My improved mode of making a billiard table cushion, viz: of a vulcanized caoutchouc body, a thin facing of hickory, or its equivalent, and a covering thereto of water-proof cloth, or other material, the whole being applied together and covered with one or more layers of cloth, substantially as described.

42. Sewing Machines; John Frost, Assignor to self and James Frost, City of New York.

Claim—The employment of the slotted arm, the rod, and pin, and the swiveling guide, or their respective equivalents, in combination with each other and with the crank, substantially as described, for the purpose of communicating the requisite irregular motion to the needle bar of a sewing machine.

43. Vulcanized Rubber Goods; H. L. Hall, Beverly, Massachusetts, Assignor to the Beverly Rubber Co.

Claim—The improvement in the manufacture of rubber goods of every description, which consists in combining fibrous materials with waste vulcanized rubber rendered soft and plastic in the manner described, whether such fibrous materials be such only as are found in old or waste vulcanized goods or fabrics, or new fibrous materials added to the rubber compound.

44. Securing the Arms to the Hubs of Propellers; H. O. Perry, Assignor to self and Sidney Sheppard, Buffalo, New York.

Claim—The employment of the conical ends confined in the corresponding sockets by the keys, substantially in the manner set forth.

45. Valves for Gas Metres; R. M. Potter, Assignor to Wm. Mackenzie, Assignor to R. M. Potter, City of New York.

Claim—The eccentric sliding valve, when constructed, arranged, and operating substantially as described.

46. Saw Mill; S. R. Smith and P. P. Lane, Assignors to Lane & Bodley, Cincinnati, Ohio.

Claim—1st, The longitudinal rack bar, combined as described, with the segment wheel, pinion, and accessory rack, so as to admit of the head blocks being placed in gear at any required distance asunder, without disconnexion or adjustment of parts. 2d, The described arrangement of the collar, box, cushions, and temper screws, whereby the saw may be fixed rigidly in any position or allowed lateral play to any desired extent, and return automatically to its normal plane when released, and by means of which the position of the said normal plane may be varied at pleasure. 3d, The perforations applied to the transverse racks, in the manner explained.

47. Sewing Machines; S. G. Tylor, Assignor to self, G. J. Savage, and J. W. Barnum, Quincy, Illinois.

Claim—Making the bearing surface of a feeding foot or pressure pad of a sewing machine, or their equivalents, with two or more parts or toes, each self-adjusting to varying thicknesses, or inequalities of surface, cording, hemming, or sewing plain work, and combining the same with a sewing machine feeding apparatus, substantially as specified.

48. Burners for Vapor Lamps; E. M. Williams, Assignor to self and John Gabel, Philadelphia, Penna.

Claim—The supplemental sliding wick tube, arranged relatively with one or more vapor tubes, to operate substantially as set forth.

49. Preventing Explosions in Steam Boilers; Jane H. Lloyd, executrix of R. L. Lloyd, deceased, late of Philadelphia, Assignor to G. P. Perry, of said Philadelphia, Pennsylvania.

Claim—Placing within a steam boiler a metallic conductor, arranged to communicate with the outside of the said boiler, substantially in the manner set forth, in order to maintain an electrical equilibrium between the inside of the boiler and the outside thereof, or with any matter surrounding or in connexion therewith, for the purpose specified.

ABSTRACTS OF SPECIFICATIONS OF RECENT PATENTS.

Two Patents granted, January 11, 1859.

Palmer's Patent Arm and Hand.

FURNISHED FOR THE JOURNAL OF THE FRANKLIN INSTITUTE.

Fig. 1, represents an arm to be applied above the elbow. The articulation A B, is a ball and socket, connected by the steel plates C C, and turning upon the pinion D. The functions of the bones in the fore-arm (Radius and Ulna,) are imitated by the conical shaft E, which terminates in a ball at the elbow and wrist J J. The wrist is articulated with a ball and socket firmly united by catgut tendons F G H tensely drawn over the convexity of the shaft E at the elbow. It has every motion of the natural wrist. The hand rotates on the fore-arm, being susceptible of pronation and supination, or any angle or degree of flexion and extension desirable. The extensor tendons K L M N O acting with the springs 1, 2, 3, 4, 5, open the hand. The detached ball and socket joints of the thumb and fingers are indicated by the figs. 1, 2, and 1, 2, 3.

The fingers are articulated on steel rods and pinions imitating the bones, as seen in the thumb and the first and third fingers. The exterior is brought to a perfect imitation of the natural arm (as shown in the outline, or in Fig. 5,) by a soft elastic substance, which rotates around the fore-arm, preserving anatomical symmetry in every position. It is covered with a delicate skin.

Fig. 2, is the same arm extended, with the fingers semi-flexed. The belt A attaches the arm to the body. The small belt C C 2, is connected by a tendon to a clasp and pulley D E. The great muscle F is the continuity of the flexor tendons G H I J K. These tendons pass sinuously over pulleys, or fixed sheaves, 1, 2, 3, 4, 5, through the hand, to the end of the fingers and thumb. The principles of the lever and pulley are thus *combined*, and the *maximum power* retained at all angles of flexion or extension. A slight motion of the shoulders, with extension of the fore-arm, produces an incredible grasp, as seen in Fig. 3.

An object of any shape, such as a pen, a fork, or an apple, is held with facility. By a slight motion of the shoulders the belt A B causes the great muscle F and its tendons, to contract *powerfully*, closing the hand. A movement easily and naturally made actuates the tendon CC, and fastens the clasp D upon the muscle, so as to retain the grasp in any position or motion of the arm when in use. This is regarded as invaluable for holding reins in *driving*, or carrying articles with *safety*. An easy counter motion *unfastens the clasp*, relaxing the flexor muscle and its tendons, and the extensors open the hand. This principle performs most perfectly in arm applied below the elbow as in Fig. 3.

Fig. 3. In this are seen the belt A B C, the great muscle F and its tendons, the clasp and pulley D E as in Fig. 2. A fixed eyelet F 2, clasps the great muscle F, and thus guides the flexor tendons of the fingers. The line 1, shows the union of the natural with the artificial arm.

Fig. 4, shows a hand holding a fork. The tendon A A 2, passes through the clasp B and around the pulley C to the side of the clasp D, where it

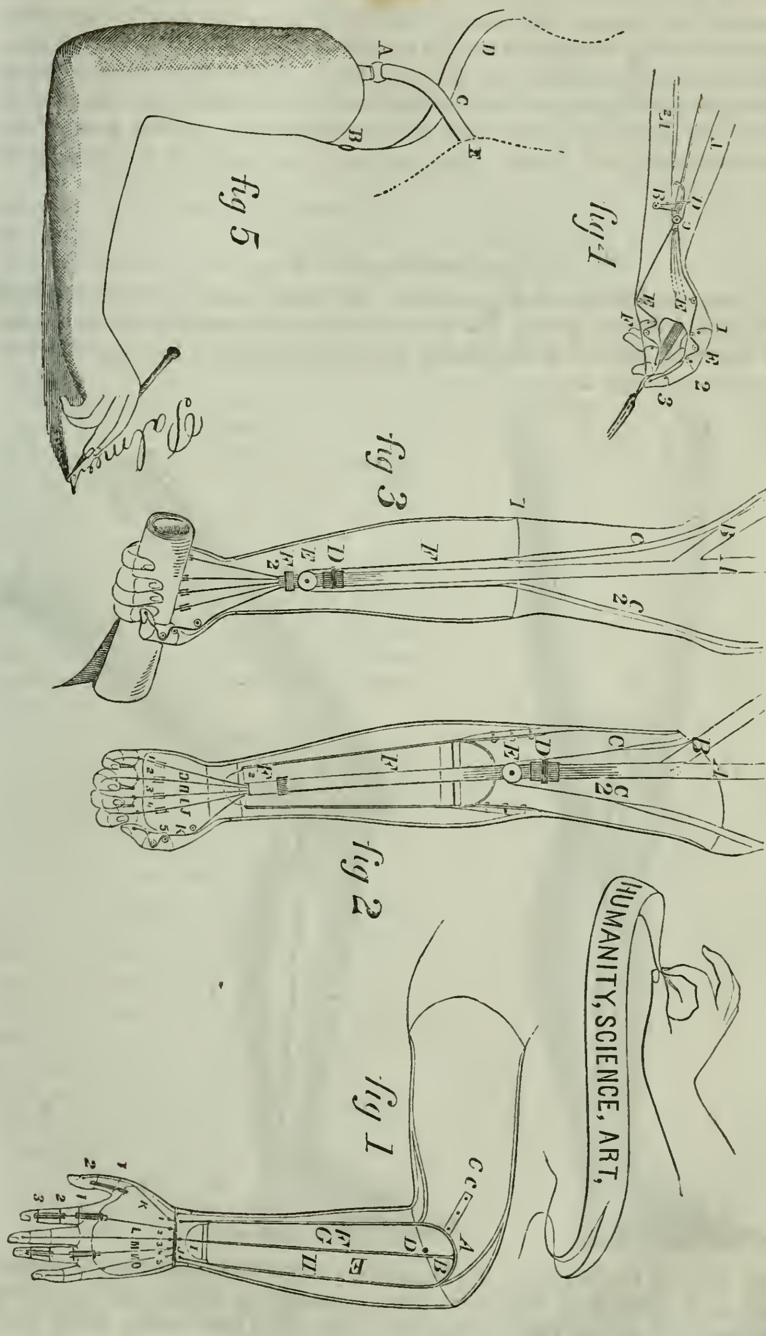


fig 5
Palmer
fig 4
fig 3
fig 2
fig 1
HUMANITY, SCIENCE, ART,

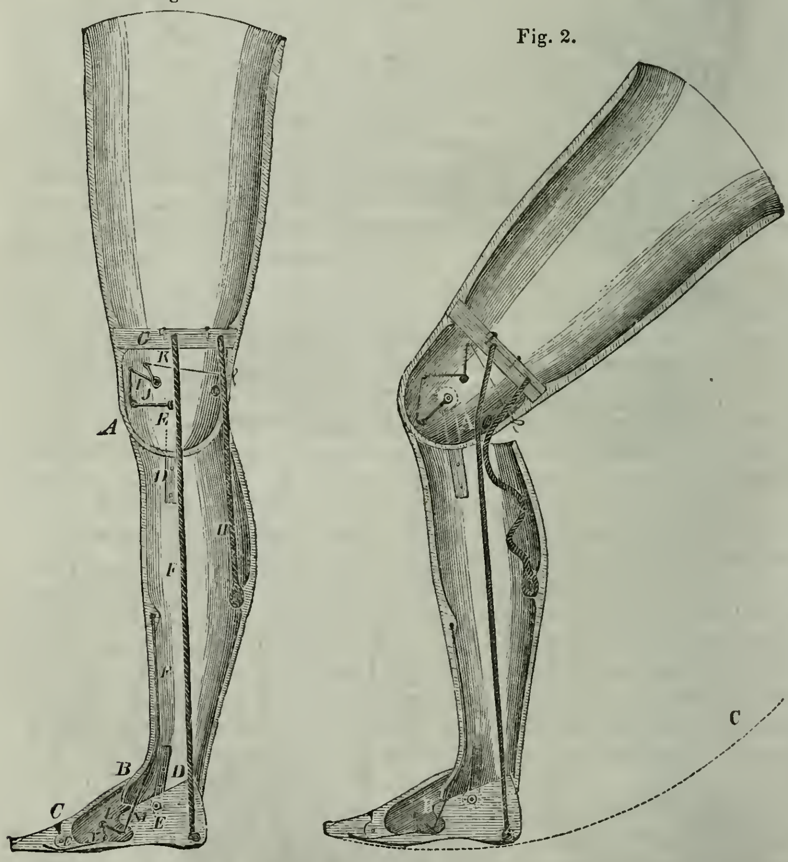
fastens or *unfastens* the clasp by movements before explained. The joints of the fingers and thumb are flexed upon the fork by powerful tension of the great muscle and its tendons. The sinuosity of the tendons passing over the pulleys, or sheaves, E E E, shows the new and useful principle of effectually combining the lever and pulley to gain the *utmost power*, *strength*, *elasticity*, and *adaptability* to the various uses of an Artificial Arm and Hand. They are easily adjusted by the wearer.

Specification of the Leg.

The articulations of knee, ankle, and toes, consist of detached ball and socket joints, A B C. The knee and ankle are articulated by means of the steel bolts, E E, combining with plates of steel firmly riveted to

Fig. 1.

Fig. 2.



the sides of the leg D D. To these side plates are immovably fastened the steel bolts, E E. The bolts take bearings in solid wood (properly bushed) across the *entire diameter of the knee and ankle*, being four-

fold more reliable and durable than those of the usual construction. All the joints are so constructed that no *two pieces of metal move against each other in the entire limb.* The contact of all broad surfaces is avoided where motion is required, and thus friction is reduced to the *lowest degree possible.* These joints often perform many months without need of oil, or other attention, a desideratum fully appreciated by the wearer.

The tendo achillis, or heel tendon, F, perfectly imitates the natural one. It is attached to the bridge, G, in the thigh, and passing down on the back side of the knee bolt, E, is firmly fastened to the heel. It acts through the knee bolt, *on a centre*, when the weight is on the leg, imparting security and firmness to the knee and ankle joints, thus obviating all necessity for *knee-catches.* When the knee bends in taking a step, this tendon vibrates from the knee bolt to the back side of the thigh, A, Fig. 2. It descends through the leg so as to allow the foot to rise above all obstructions, in flexion, and carries the foot down again, in extension of the leg for the next step, so as to take a firm support on the ball of the foot. Nature-like elasticity is thus attained, and all thumping sounds are avoided.

Fig. 3.

Another tendon, H, of great strength and slight elasticity, arrests the motion of the knee, gently, in walking, thus preventing all disagreeable sound and jarring sensation, and giving requisite elasticity to the knee.

A spring, lever, and tendon, I J K, combining with the knee bolt, give instant extension to the leg when it has been semi-flexed to take a step, and admit of perfect flexion in sitting.

A spring and tendons in the foot, L M N, impart proper and reliable action to the ankle joint and toes. The sole of the foot is made soft to insure *lightness and elasticity of step.*

The stump receives no weight *on the end*, and is well covered and protected to avoid friction and excoriation.

These joints, springs, and tendons are all *patented*, and no modification of any part will enable a person successfully to evade the patents, which contain about *twenty distinct and combined claims*, covering nearly the *entire mechanism.* Fig. 3, is a view of Palmer's perfect model.

Palmer's Patent Leg is composed of a great variety of such materials as most effectually combine to give a perfect imitation of the

human limb. This combination of substances, all experience has taught, produces a much lighter, stronger, and comelier artificial limb than can be made chiefly of any one material. Wood, metal, gutta percha, and india rubber have all been tried again and again, and been abandoned by all mechanicians who were competent to construct, and also by all experienced wearers of false limbs, who can duly appreciate the qualities of a perfect substitute.

This invention differs radically from all other false limbs, and is fully protected by various patents. It is so symmetrical and life-like in appearance and motion, as to be often mistaken, when in use, for the natural limb. The internal mechanism is so perfectly combined, and the polished exterior so exquisitely colored and finished, that delicate silk hose and slippers may be worn without betraying the work of art.

The external skin, though delicate in appearance, is very strong. It is indissolubly cemented without perceptible seam, and rendered impervious to water by a beautiful skin-tinted enamel, which is rivaled only by the color of the natural skin.

The mechanism is adapted to all forms of amputation, whether above or below the knee, or through the foot, and is successfully applied to the shortest and tenderest stumps. It is attached to the body in a manner which insures entire comfort.

The distinguishing characteristics of this Patent Leg are its life-like elasticity and flexibility, excessive lightness, durability, adaptability, and perfection of external appearance. These elements have been accorded to it by the first Surgeons of America, England, and France, and by nearly three thousand mutilated persons, who are now in the daily use of this Invention.

Palmer's Patent Arm is an original invention, which has cost years of study and experiments. It has been duly tested by numerous ladies and gentlemen, and pronounced equal to the Patent Leg.

MECHANICS, PHYSICS, AND CHEMISTRY.

Notice of Mr. L. C. Stephens' Patent Combination Rule.

To the Committee on Publications.

Gentlemen:—As all simple and comparatively accurate instruments for the use of engineers and mechanics, whereby they are enabled with facility to make measurements and calculations are of importance, I would call their attention through your *Journal* to a combination rule manufactured by L. C. Stephens & Co., of Pine Meadow, Connecticut. This rule is composed of two arms of 6 inches in length, each folding together by one joint; when folded, it is $1\frac{3}{8}$ inches wide and $\frac{3}{8}$ of an inch thick, and is protected by strong brass binding;—its weight only slightly exceeds the ordinary pocket rule. The combination consists of its having a spirit level let into the upper brass binding of one of the six-inch arms—the glass is let into the rule

and protected by a brass plate put on with screws, and therefore can be removed and replaced in case it should accidentally be broken. There is a steel blade shutting into the other arm, having the axis upon which it moves near the opposite extremity from the joint of the two arms proper. When this blade is opened out from the arm, and is raised so as to form an angle of 90° with said arm, it is prevented from opening further by two stops in the arm, one placed below the axis and the other above. The upper arm, or that containing the level, can then be closed down—the steel blade fitting into a slit at the outer end of the arm. In this end there is an eccentric, which, at pleasure, can be made to press slightly against the blade, and thus hold it rigid. One side of the blade is marked with lines which show the value of the angle formed by the two arms of the rule, the blade being moved until the under edge of the slit arm is coincident with the mark on the blade showing the required angle then the two inner, or two outer edges of the arms will show the containing lines of the angle. The other side of the blade is marked in inches and twelfths. The inner edge of the arm in which the blade closes is also divided into inches and twelfths, so that when the blade is in a position at right angles with this arm it may form a brace scale.

The inner edges of the arm holding the level is also marked, so that it may show the angle formed by the blade and its own arm. The arms on their sides are divided into inches, eighths, and sixteenths, as in ordinary rules, also into tenths of inches, and also into several scales for the convenience of draughtsmen.

The uses of this convenient little instrument are very numerous—when the blade is closed into its arm and the arms are shut together, it is a spirit level. When the blade is opened at an angle of 90° with its arm, and the other arm shut down so that the slit holds the blade rigid, the blade is perpendicular to the edge containing the level, and the instrument can then be used as a plumb. The combination of a level and moving blade, and arm for obtaining angles, will, to any one in possession of the instrument, suggest various methods of obtaining heights, distances, &c. Besides the above uses, for all measurements requiring only the ordinary foot rule, it will, from the sub-divisions on the sides of the arms, answer the purpose. H. J. T.

Mode of Preserving Fresh Fruits.

Dissolve gutta percha in sulphuret of carbon. The liquid separates into three layers, the upper of which contains mucilaginous matters, and the lower earthy compounds and other impurities; the middle layer is perfectly limpid and contains the pure gutta percha. Separate this from the others by a syphon.

Gather the fruits rather before complete ripeness—dry and brush them; dip them in spirits of wine; then two or three times in the gutta percha liquid; they may then be kept in a box or closet, the temperature of which must not exceed 50° Fahr.

When the fruit is to be eaten, the coating may be peeled off or washed off with a little spirits of wine; and, notwithstanding time and journeys, the fruit will be found to have preserved its taste and perfume, as though it were perfectly fresh.—*Cosmos.*

For the Journal of the Franklin Institute.

Particulars of the Steamer White Cloud.

Hull built by Thomas Collyer. Machinery by Morgan Iron Works. Owners, I. M. Forbes & Co.

HULL.—			
Length on deck,		180 feet.	
" load line,		179 "	
Breadth of beam, (*molded*,)		30 "	
Depth of hold,		10 "	7 inches.
" to spar deck,		10 "	7 "
Frames, *molded*,			14 "
" *sided*,			8 "
" apart at centre 26 ins., and strapped with diagonal and double laid braces, $3\frac{1}{2}\times\frac{1}{8}$ ins.			
Draft of water,		5 "	6 "
" at below pressure and revolutions,	24.		
Tonnage,	550.		
Masts—Two—Schooner rigged.			
ENGINES.—Vertical beam.			
Diameter of cylinder,			44 inches.
Length of stroke,		10 feet.	
Maximum pressure of steam,	30 lbs.		
Cut-off,	variable.		
BOILERS—Two—Single return flued.			
Length of boilers,		26 feet.	
Breadth "		8 "	6 inches.
Height " exclusive of steam chimney,		8 "	
Number of furnaces,	4.		
Breadth of furnaces,		3 "	6 "
Length of grate bars,		7 "	
Number of flues,	above 4. below 10.		
Internal diameter of flues,	above 17 ins. below 10, 12, and $12\frac{1}{2}$ ins.		
Length of flues,	above 14 ft. 7 ins. below 13 ft. 11 ins.		
Heating surface,		2284 square feet.	
Diameter of smoke pipe,		5 feet.	
Height "		31 "	
PADDLE WHEELS.—			
Diameter, overboards,		26 "	
Length of blades,		7 "	
Depth "		3 "	
Number "	24.		

Remarks.—One independent steam, fire, and bilge pump, constructed for service on Canton River; water-wheel guards for half width extends fore and aft. Date of trial, January, 1859. C. H. H.

For the Journal of the Franklin Institute.

Particulars of the Steamer Karnak.

Hull built by Denney & Brothers. Machinery by Tullock & Denney, Dumbarton, Scotland. Intended service, New York to Havana.

Hull.—		
Length on deck from fore part of stem to after part of stern post above spar deck,		210 feet.
Breadth of beam at midship section,		30 " 10 inches.
Depth of hold to spar deck,		25 " 6 "
" main deck,		18 " 6 "
Frames Z ∠ at throats, *molded,*		4½ "
" " *sided,*		⅜ "
" distance apart at centres,		14 "
Keel,		6 "
Length of engine and boiler space,		30 "
Draft of water at load line,		18 "
" below pressure and revolutions,		18 "
Area of immersed midship section at this draft,		495 sq. feet.
Tonnage,	958.	
Contents of bunkers in tons of coal,	740.	
Masts and rig—Barque.		
Engines.—Vertical direct.		
Diameter of cylinders,		48 inches.
Length of stroke,		2 feet 3 "
Maximum pressure of steam in pounds,	10.	
Maximum revolutions per minute,	56.	
Boilers.—Two—Horizontal return tubular.		
Length of boilers,		10 feet 6 inches.
Height " exclusive of steam chimney,		15 "
Number of tubes,	432.	
Internal diameter of tubes,		3 "
Length of tubes,		6 " 9¾ "
Diameter of smoke pipe,		5 "
Description of coal,	Bituminous.	
Propeller.—		
Diameter of screw,		12 " 6½ "
Pitch of screw,		19 "
Number of blades,	3.	

Remarks.—Has wrought iron plate stringers on each deck, and frame ties $2\frac{1}{2} \times \frac{3}{4}$ inch; 12 inches apart in lower hold; also, five water-tight bulkheads. Carries 626 tons of cargo and 4200 gallons of water in bunks.

C. H. H.

Preparation of Calcium.

MM. Lies-Bodart and Jobin announce to the Academy of Sciences at Paris, that they had succeeded in preparing calcium in a purely chemical way, by heating the iodide, with potassium in an iron crucible, closed by a cover screwed on air-tight.

This mode may be at present convenient to chemical professors and students who do not often see this metal, and the fact evolved, that this re-action takes place under high pressure, which it does not under the pressure of the atmosphere, may perhaps lead to results more important on the large scale of industry.

For the Journal of the Franklin Institute.

Particulars of the Steamer Baltimore.

Hull built by John A. Robb. Machinery by Murray & Hazlehurst, Baltimore, Maryland. Intended service, West Indies.

HULL.—

Length on deck from fore part of stem to after part of stern post above the spar deck,		150 feet.	
Breadth of beam at midship section, above the main wales,		20 "	6 inches.
Depth of hold,		8 "	6 "
" to spar deck,		15 "	
Floor timbers at throats, *molded*,		11 "	
" " *sided*,		8 "	
Frames, distance apart at centres,		2 "	3 "
Depth of keel,			6 "
Draft of water at load line,		10 "	6 "
" below pressure and revolutions,		10 "	
Area of immersed midship section at this draft,		170 sq. ft.	
Tonnage,	252.		
Contents of bunkers in tons of coal,	50.		
Masts, 3.—Rig—Foretopsail schooner.			

ENGINE.—Vertical direct.

Diameter of cylinders,			35 inches.
Length of stroke,		2 feet	3 "
Maximum pressure of steam in pounds,	30.		
Maximum revolutions per minute,	75.		

BOILERS.—One—Single return tubular.

Length of boiler,		14 feet.	
Breadth "		9 "	
Height " exclusive of steam chimney,		11 "	8 inches.
Number of furnaces—two.			
Length of grate bars,		5 "	
Number of tubes,	74.		
Internal diameter of tubes,			$3\frac{3}{4}$ "
Length of tubes,		10 "	
Heating surface,		1000 sq. ft.	
Diameter of smoke pipe,		3 feet	10 "
Height " from top of boiler,		34 "	
Description of coal,	Anthracite or bituminous.		
Consumption of coal per day,	7 tons.		

PROPELLER.—

Diameter of screw,		9 feet.
Length of blades,		2 "
Pitch of screw,		18 "
Number of blades,	3.	

Remarks.—Has two bulkheads. C. H. H.

Origin of Bituminous Schists.

M. A. Riviere communicated to the Academy of Sciences at Paris, at their Session of 25th October, 1858, a curious observation which had led him to a new theory of the origin of certain rocks of the crust which are found to contain a small quantity of combustible matter.

He was first struck by the resemblance between these rocks and the earth saturated with ordinary coal gas by the leakage of the pipes which convey it. By a series of experiments he found,

1st, That the soil surrounding the pipe, was in certain circumstances, and after some time, more or less impregnated with carbon and bitumen, so as to become sometimes very combustible, and as black as impure coal.

2d, That the nature of the soil had much influence on the absorption; thus, whilst a clayey, slightly damp soil charged with vegetable or animal debris favored this absorption, it was, on the contrary, but slight in dry sand.

3d, That the thickness of the upper strata favored absorption.

4th, That it was greater near the cracks and stratification joints.

5th, That the absorbing materials increase in weight and sometimes in bulk.

6th, That the vegetable matters were gradually converted into carbon more or less bituminous according to circumstances.

7th, That the ferruginous materials were altered, more or less converted into oxides, sulphates or sulphites; and that they would probably have been converted into sulphurets and carbonates, had the gas been less purified, and had the action been sufficiently prolonged and the circumstances favorable.

The immediate means to be taken for the Relief of Workmen Smothered in Wells. By M. P. Doré, formerly Preceptor in Chemistry at the Polytechnique School, Paris.*

In consideration of the numerous accidents of this nature which happen daily, we cannot too forcibly call attention to the simplest means of preventing fatal consequences.

1. When a workman has fallen fainting at the bottom of a well, while some one is sent for the nearest physician, the person who is to descend into the well in order to bring up the suffocated man, should prepare, by tying over his mouth a bag of muslin filled with dry lime and Glauber salts (sulphate of soda,) quickly powdered and intimately mixed. This precaution is destined to prevent the vitiated air of the well from making another victim. (S. Girardin de Rouen, *Leçons de Chimie*, p. 39.)

2. That done, it is necessary to let down at the same time and in advance of the rescuer a lighted candle, to determine at what depth the layer of vitiated air commences—and the second man should not be left at the bottom of the well longer than the time strictly necessary to permit him to attach to the fainting man a second rope, which has been let down in the meantime.

The man having been brought to the surface, if the physician has not arrived, the following directions should be observed:

* From "Les Nouvelles Annales de la Construction."

3. Expose the patient in the open air, naked, without fear of the cold or the rain, placing him on his back, the head and the chest elevated.

4. Throw with much force over the surface of the body, and particularly over the face and chest, tepid water, or even cold water if in summer, continuing to do so until respiration commences.

5. In the meantime rub the body, and especially the chest, with cloths dipped in vinegar and water, cologne water, or even brandy. Every four or five minutes dry the body with warm cloths, and then continue the friction and the dashing with water.

6. Rub with a brush the soles of the feet, the palms of the hands, and the spine.

7. Cause him to smell hartshorn at intervals, without allowing the bottle to remain for too long a time under his nose.

8. Finally, if the suffocation has taken place in a foul well in consequence of sulphuretted hydrogen, it will be useful to pass under his nose a vessel containing chloride of lime and vinegar, or a solution of chloride of potassa.

Such should be the treatment of the patient while waiting for the arrival of a physician.

In order to assure those who find it necessary to give assistance in such cases that they cannot employ too fully the dashings of cold or tepid water, we cite the following case, observed in the winter of 1802, of a nurse in the "Hospital Murat" at Narbonne, by Doctor Darbon, then physician to that hospital.

It was noticed one morning at the time of inspection, that one of the nurses was absent. On going to his chamber they found him suffocated by the fumes of charcoal. Every remedy was applied, and still at two o'clock in the afternoon the patient had given no signs of life. Then Dr. Darbon commenced dashing tepid water over him with violence, using a sauce-pan with a long handle, which gave great force to the dashes of water.

At the end of *four hours* of this treatment, the patient revived, was placed in a warm bed and carefully attended to, and in four days resumed his duties.

We may add that M. Bourgeois mentions a case where the patient only revived after *twelve hours* of this treatment. F. R.

New Copying Telegraph of M. Bonelli.

Many months ago the editor of the *Cosmos*, a Parisian weekly journal of great excellence, announced, with no little pomp, the invention of this apparatus by M. Bonelli, and pronouncing it entirely different and very superior to any thing hitherto known, promised a precise description in the next number. After awhile another article began the fulfilment of this promise by a history and criticism of known instruments, in which there was nothing new but the unfairness towards the

inventors. This article was to be continued in the next number, when we were to have at last the description of the new wonder, but from that time until the number of 17th September, no word has been seen about it. And now we have, not a continuation of the former grand flourish, but a new article beginning "still another telegraphic marvel." Then follows at last a description of the Bonelli invention, which, it appears is the same as that invented by Bakewell, in England, and long known here; in which the electric current passing through an iron wire decomposes yellow prussiate of potassa, and deposits Prussian blue, thus writing in yellow letters upon a blue ground, (Abbè Moigno says green,) when the original despatch is written upon metal or paper soaked in a metallic salt with a varnish ink. The only difference is, that whereas the old conductor was a single wire, Bonelli's is a rope of from fifty to sixty insulated wires, which are spread into brushes at their end, and the different parts of the despatch are thus copied at the same time, and the article is done in one-fiftieth or sixtieth of the time. This is ingenious and important; the only question is, whether the improvement will pay for the increased expense. The Abbè estimates the expense of the new conductor at from 1000 to 1200 francs per kilometre; that is, from \$320 to \$390 per mile. If it can be put up for this, it will probably be an improvement on our present systems.

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*Steatite Gas-Burners.**

M. Schwartz, of Nuremberg, has succeeded in manufacturing gas-burners of steatite or soapstone; the following description of which is given by *Le Génie Industriel:*—

"The materials hitherto used in making gas-burners, such as iron, brass, &c., possess the inconvenience of oxidizing during the combustion of the gas, and in a short time the holes or the slits become enlarged, the burners consume a larger quantity of gas, and the flame is less brilliant. Burners made of porcelain, which substance has been proposed as a substitute for metals, have not answered so well as was expected, because that material becomes rapidly porous by heat. These inconveniences suggested to M. Schwartz the idea of making burners of the steatite or soapstone that is found at Gopfergrün, in the district of Wensiedel, in Bavaria; which, according to the analysis of Professor Kaiser, consists of 30 parts of magnesia, 60 of silica, 5 of water, and 3 of the oxide of iron.

"This substance is cut into rectangular pieces, which are put into a muffle that is hermetically closed. It is then exposed to heat for four or five hours; the heat being at first slack, but afterwards raised till the muffle is red hot. This operation requires great care, because the stone easily splinters; and it is on that account that a moderate heat is at first used to expel the water. The higher temperature is not employed until that is effectually done, after which the violent heat is kept up for two hours. All impure pieces of steatite must be carefully

* From the Journal of Gas Lighting, &c., Aug., 1858.

thrown aside; those, for instance, which have ferruginous streaks, or argillaceous specks.

"After this preparatory process, the calcined stone is put on a lathe to reduce it into form, and as the steatite does not completely lose its property of absorbing moisture from the air by the first calcination, the burner is then immersed in pure oil, in which it is boiled till it becomes of a dark brown color. It is then dried, and is polished with a lock of wool. In cutting and piercing the burner, advantage is taken of the natural cleavage of the stone, of which the workman soon learns how to avail himself.

"The principal constituent elements of steatite, the silica and magnesia, resist the heat to which they are subjected without change, and consequently remain unaltered by the highest temperature to which they are exposed in the burning of gas. The process of calcination, by depriving the stone entirely of the water it contained, seems to render it more compact. Steatite also possesses the property of contracting by heat, and after four or five days use the holes or slits of the burners are not increased in size. This fact has been proved in burners that have been kept constantly in action for eight weeks, at the end of which time a kind of varnish or glaze, of a flinty character, was collected on the edges of the slits.

"Professor Liebig recommends the steatite burners for use in chemical laboratories. That eminent chemist is of opinion that these burners possess the advantage over metal ones, that the height of the flame can be regulated most exactly without any flickering, and, the flame being steadier, it can be more enlarged."

Accidental Production of Colors in Photographs. By M. Muguet.

"I will state the circumstances under which I obtained natural colors, in taking, the other day, a stereoscopic picture of some ruins covered with ivy. Each glass plate had been exposed twenty seconds, the sun shining brilliantly, and on developing I was astonished at finding the color strongly developed: the ivy was represented by a deep green tint, some old timber of trees by a brown, the stones by a gray; all with colors in the highest degree varied. Fixing did not alter them, but in drying, they lost their brilliancy, with the exception of the green, which has remained as decided as at first. In taking a second picture the same effect was produced, but with less strength.

The collodion was, perhaps, two months old, nearly colorless, and gave a thin coat. It was prepared by Mr. Robinson, chemist, who assured me that he had iodized it with iodide of potassium with a little bromine.

The bath was a neutral solution of crystallized nitrate of silver. I had developed with a solution formed of two grains of pyro-gallic acid, 20 drops of acetic acid dissolved in one ounce of water, and fixed by a concentrated solution of cyanide of potassium."

M. Raymond remarks that if, as soon as a collodion picture begins

to develop clearly under the combined action of pyro-gallic and acetic acid, it be exposed to the light without previous drying, it is rapidly changed into a positive picture, and takes more or less perfectly the colors of the model. The stronger the light is, and the less the development of the picture, the more rapid but at the same time the less perfect is the transformation. A picture accidentally made in this way was completed in a quarter of an hour, and lasted some months with scarcely any loss of brilliancy, and even now, after more than two years standing on a shelf in the laboratory, it is not completely effaced.

In reference to this communication, M. Bertsch reminded the hearers, that every photographer had frequently observed that when the development of a direct positive was arrested at a certain point, and the picture placed on a black ground, effects were obtained which imitated the natural color very well. The whole picture takes on a rose-color, which imitates tolerably well the tones of the face; and as the hair and dress, which are darker than the face, are but slightly brought out, they allow the black color of the ground to appear through them, and thus produce the appearence of a coloring which does not in reality exist.—*Cosmos.*

A Lunar Tide upon Lake Michigan.

The annual meeting of the Chicago Historical Society was held last evening at the house of Hon. I. N. Arnold, on Erie Street.

Among other important facts communicated, Colonel Graham stated, as the result of a long and carefully conducted series of observations, his discovery of a lunar tidal wave upon Lake Michigan. From the comparatively small area of the body of water acted upon by the lunar influence, the co-ordinate of altitude could not be but small. This circumstance, added to that of the almost constant disturbance of the lake surface by winds, renders this co-ordinate of altitude measurable only in calm weather, and when the moon is in conjunction with or in opposition to the sun. At such times its average is about two-tenths of a foot, or say $2\frac{1}{2}$ inches.

This announcement will be a matter of much interest to the scientific world generally.—*Chicago Daily Journal, Dec.* 1, 1858.

Preparation of a Detonating Compound of Silver by means of Coal-Gas.

By MM. Vogel and Reischauer.

If a current of ordinary coal-gas be passed through a neutral solution of nitrate of silver, the liquor soon becomes troubled and a crystalline precipitate is deposited. Under the microscope this precipitate is seen to be composed of a mass of small prisms, but its dominant property is that, after drying, it explodes as violently as fulminating

silver by heat or by the hammer. It however is distinguished from the fulminate of silver by the form of its crystals, its behavior with boiling water, its decomposition by potassa, and the quantity of silver which it contains; but especially by the fact that it is entirely decomposed by chlorhydric acid with evolution of a gas, which is combustible, and has the penetrating and peculiar odor of coal-gas. By means of this reaction the author determined the content of silver, and found from 78·3 to 84 per cent.

If the solution of nitrate be acid, the amount of precipitate is much diminished. If the acetate be used, a gray compound is formed which detonates, but less violently than that from the nitrate. By continuing to pass the gas through an acid solution of acetate of silver for several days, the silver was so completely precipitated, that the liquid gave no precipitate with chlorhydric acid.

If the gas from the decomposition of the precipitate from nitrate of silver by chlorhydric acid, be passed through another solution of the nitrate, it forms a brilliant white precipitate of microscopic crystalline needles. This precipitate also detonates with great violence.

As this compound burns with great difficulty by oxide of copper, the authors did not succeed in analyzing it; but hope to do so by the examination of the gas evolved by chlorhydric acid.

They remark also that the formation of this body seems to depend on the nature of the gas; so that sometimes the first bubbles of gas produce considerable turbidity, while at other times, it is only after some hours, that the action is manifested.—*Academy of Sciences of Munich*, 16*th January*, 1858.

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*Process for Obtaining Aluminium.** Patented by Luigi Ferrari Corbelli. January 26, 1858, in London.

By the improved process the metal is obtained direct from argillaceous earth or clay, which after being well washed and cleansed from extraneous matters, such as stones, sticks, leaves, and such like substances, is submitted to the following process:—Take one hundred grammes of the well-washed clay, and after well drying it, dissolve it in about six times its weight of concentrated sulphuric acid or very strong hydrochloric acid. Dry the clay again, and heat it in an earthen vessel up to four hundred and fifty or five hundred degrees of the centigrade thermometer, after which mix with it two hundred grammes of yellow prussiate of potash, which should be quite dry and pulverized. The quantity of this material that should be added to the clay, will depend in some measure upon the quantity of siliceous matter contained in the clay. To this mixture add one hundred and fifty grammes of common salt, and place all the ingredients when intimately mixed together in a crucible. Heat them up to a white heat, and after the mass is cool, the aluminum will be found at the botton of the crucible.

* From the London Repertory of Patent Inventions, No. 778.

A New and Economical Furnace.

The principle of M. Beaufumè's furnace is, the production of inflammable gases by the distillation of the combustible, in a separate apparatus, and the conduction of these gases to be burned in the furnace in place of the fuel itself. The apparatus is said to have been already employed for plaster and porcelain furnaces, and to have produced an economy of 30 and in some cases of 60 ℔ cent.; and in other experiments to have evaporated 10·544 k. (23¼ lbs.) of water under a mean pressure of 4 atmospheres, with a consumption of 1·5 k. (3⅓ lbs.) of coal per hour; whilst with the same charge of fuel, the ordinary furnaces vaporize on an average not more than 6 k. (13¼ lbs.) The furnaces are also much less liable to be burned than with ordinary fuel.

Cosmos.

Improvements in the Treatment or Preparation of Moulds for Casting Metals. Patented by ANDREW and THOMAS WALKER. January 19, 1858, in London.*

Our said invention relates to the treatment or preparation of the surfaces of sand moulds for casting metals by means of anthracite, "blind," or "stone" coal dust. The coal or mineral preferred for this purpose is anthracite, but any coal of an anti-bituminous kind will answer for carrying out the improvements. The coal or anthracite mineral is used in its natural condition, as dug from the earth, being merely reduced by mechanical means to the proper condition of powder or dust. The powder or dust is placed in permeable bags, and dusted upon the mould surfaces with which the metal will come in contact when the casting operation takes place. The same material may also be used as a wash for moulds; it may also be employed mixed with sand, as in the case of common coal-dust. This system of preparing mould surfaces secures economy in the materials used, whilst it also enables the founder to produce extremely sharp and fine castings.

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*Improvements in Submarine Conductors of Electric Telegraphs.** Patented by JOHN CORNISH HARCOURT SIEVIER. February 13, 1858.

My invention consists in coating copper wire to be employed as a submarine conductor of electricity with bismuth, tin, iron, lead, brass, antimony, zinc, nickel (by preference containing arsenic), or German silver, or with any combination or alloy of two or more of these metals, prior to the treatment of such copper wire with any means of insulating, either by gutta percha, shellac, tar, bituminous or resinous substances, fibrous materials, or other substances, and likewise prior to the application of the wire cable. Copper being a powerful conductor of electricity, my object is to coat copper wire with a metal or alloy or combination of metals having a much less degree of conductibility than

* From the London Repertory of Patent Inventions, No. 778.

copper, in order that the copper may become more easily insulated than it would otherwise be if surrounded or encased as usually with gutta percha or other insulating materials, without being first coated with a metal or alloy or combination of metals having comparatively slight degree of conductibility.

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*Lecture on Rotary Stability and its Applications to Astronomical Observations on board Ships.** By the Rev. Prof. BADEN POWELL.

The object of the discourse was to explain an apparatus recently contrived, for the purpose of giving perfect stability for the nicest astronomical observations on board a ship pitching and tossing with every wave and gust of wind. This contrivance has been the result of a principle of rotary motion, which, although long since understood and acknowledged in theory, has been but lately considered with regard to its practical results, and when first tangibly exhibited in the gyroscope or free balanced revolver, had excited unbounded surprise. It was forgotten how perfectly similar, and equally paradoxical in its nature, is the common and familiar result of a top sustained by the mere act of spinning in a position from which it directly falls when the rotation ceases. On a former occasion, on the 3d of March, 1854, the Professor brought under the notice of the members the principle of "composition of rotations," and those applications of it which had been formed in certain rotary phenomena of projectiles, illustrated by the gyroscope in its several earlier forms, as successively modified by Bonenberger, Atkinson, Fessel, and Wheatstone, showing the identity of those results on a small scale, with the grand cosmical phenomenon of the precession of the equinoxes. Since that time the same principle had been applied by M. Foucault to prove the earth's rotation on its axis, and which the lecturer said had been pointed out eighteen years before, by Mr. Sang, of Edinburgh, and only not practically accomplished from the expense of the necessary apparatus. The rotary apparatus, which the lecturer proceeded to explain, for giving an invariable plane or platform for astronomical instruments used at sea, was invented by Prof. C. P. Smyth. Two simple first principles in dynamics give the clue to the whole of the applications. 1. The tendency of a body in rotation to retain that rotation in the same place, when perfectly balanced, irrespective of the motion of external objects, which is termed "the fixity of the plane of rotation." 2. "The composition of rotary motion," or that when a force is impressed on a body in rotation, it does not show itself directly, but is compounded with the fixed motion, so that the rotation takes an intermediate direction, or the axis shifts its position in space. This being the cause of the motion of the earth's axis, giving rise to the precession of equinoxes, it is generally called a "precessional motion."

One of the most important desiderata of nautical astronomy has always been the means of observing at sea the eclipses of Jupiter's satellites—so frequently recurring, and affording so simple and direct

* From the London Practical Mechanics' Journal, October, 1858.

a means of obtaining the longitude. Stability on board ship is essential to this, and many schemes have been invented for the purpose of supporting the telescope, and the observer with it, so as to be free from the motion of the ship. In general, to procure this stability, it seemed an obvious resource to suspend any object which it was desired to keep steady by cords from a fixed point in the vessel. But a body thus suspended is like a plumb line; when the point of support is itself set in motion, it acquires a part of that motion, and becomes a pendulum, and it oscillates more irregularly and violently, from the accumulations of motions impressed upon it continually by every fresh motion of the ship. Nairne's or Trwin's "marine chair" for carrying the observer and the telescope was simply an application of this principle. It was found not to answer, as the principle upon which it was constructed tended to perpetuate disturbances rather than destroy them. In these cases the centre of gravity is *below*. If it were suspended in gimbals, so that the centre of gravity should be at the point of suspension, the tendency to oscillate from this cause would be overcome. But still any slight cause might disturb the level; there would be no principle of permanent stability. Thus, to produce this desirable stability for a place or stand on which the telescope is to be rested, we must have recourse to the free revolving disk accurately balanced within gimbals, on its centre of gravity. The balancing must be perfected by means of the adjustable plugs before-mentioned, both in the disk, and in the gimbal frames; the pivots of the gimbals must be of perfect workmanship, to turn with the least possible friction, yet without looseness or displacement. An immense rotary velocity must be communicated to the disk by machinery, of which its suspension must be quite independent, so that the moving power can be instantaneously withdrawn. The Professor stated, that all these conditions are fulfilled in the form of the machine, which, after repeated trials, has been adopted by Prof. Smyth, exhibited by him at the Paris Exhibition, 1855, and successfully tried on board Mr. Stephenson's yacht, "*Titania*," on his voyage to Teneriffe, in 1856. A free revolving disk in gimbals, externally turning on pivots horizontally resting on supports fixed to the deck, will suffice to preserve the telescope from all deviation due to pitching and rolling. The addition of another disk, freely revolving in a vertical plane, whose external pivots turn vertically in a frame attached to the top of the former internal frame, the upper pivot projecting through it, and carrying a small platform for the telescope, and the whole, of course, balanced below, will preserve the telescope from any lateral deviations of the ship. And the combination of the two will give a plane retaining its parallelism against all those causes of disturbance. But under favorable circumstances this last cause of disturbance is but small, so that this addition may often be of little importance. Thus we have the whole construction of what the inventor designates as "the compound precessional free revolver stand."

The Professor concluded by taking a summary view of the whole subject. By direct consequence from the simplest acknowledged mechanical principles, the gyroscope, when its equilibrium is slightly disturbed,

demonstrates the precession of equinoxes, explains the boomerang, and sustains itself in the air against gravitation. When its equilibrium is undisturbed, it exhibits to the eye the actual rotation of the earth; and when restricted to one plane, it acts as a magnetic needle without magnetism, or spontaneously rotates in parallelism with the earth. To these remarkable, diversified, and somewhat paradoxical applications, there is now added another of far higher utility—that it gives perfect stability for the nicest astronomical observations on board a ship pitching and tossing with every wave and gust of wind.

Before the Royal Institution.

For the Journal of the Franklin Institute.

Chemical Examination of the Commercial Varieties of "Common Salt," or Chloride of Sodium. By Campbell Morfit.

Referring to the composition of the natural sources of the commercial varieties of chloride of sodium, such as salines, bay and sea waters, it is very reasonable to suppose that the derivative substance should comprise all or many of the constituents of the original material. These constituents are chlorine, bromine, iodine, fluorine; sulphuric, nitric, phosphoric, boracic, and silicic acids; sodium, potassium, magnesium, calcium, aluminum, iron, oxygen, and insoluble matter. Though only a portion of those that may be present are in appreciable amount, the examination was very exact, and with a view to detect any or all of them, however minute might be the trace. As lead and copper vessels are sometimes used in the manufacture of salt, there was also a search for any traces of those metals that might have been thence derived. The proportion of accidental water was likewise determined.

Fluorine.—This element was not found in any of the specimens, notwithstanding the great care with which it was sought. One hundred grammes of salt were dissolved in pure water and treated with a solution of chloride of calcium. The precipitate was collected on a filter, and after being thoroughly washed, rinsed off into a leaden cup and heated upon the sand bath, first to expel water, and then with sulphuric acid under a glass cover for some hours, but without obtaining the least corrosion of the glass. The salt was not treated directly, because the large quantity necessary to give an accurate result causes a copious elimination of chlorine, which would interfere with the reaction, and be otherwise inconvenient and disagreeable. Doubtful, too, whether the fluorine existed wholly or only partially in soluble combination, I preferred treating together both the insoluble residue of the salt and the precipitate formed from it, by chloride of calcium which carries down any fluorine that may be present.

Iodine.—Previous experimenters have reported the presence of this element in some salts, but I could not detect it, though I applied the most delicate tests, and operated on the large quantity of 100 grams. It remains, doubtless, with the bromine in the mother water.

My first essays were with chloride of palladium, which was added to a clear and dense solution of 100 grammes of salt: but even after a

night's repose under paper cover to keep out dust, not the least precipitate or cloudiness ensued, as should have followed from the presence of even as small a quantity as 0·0001.

To make assurance doubly sure, this essay was checked by Moride's test, which consisted in adding two drops of fuming nitric acid to a portion of the above made solution of salt, shaking well, and pouring in one drachm of benzole previous to a second shaking. Benzole being an eminent solvent of free iodine, rises to the surface, and assumes a bright red color in ten or fifteen minutes, if that element is present. More than the above quantity of acid should not be used, else chlorine will also be liberated and mask the color; nor must the test be heated or exposed too long to air, for the iodine will volatilize and leave the benzole colorless. This test is delicate to 0·0002 of iodine, as was verified by actual experiment.

This mode not only serves for a qualitative test, but for the quantitative estimation of the iodine, as the benzole will contain all that may be present, and need only to be removed with the pipette, washed with water, and treated with nitrate of silver. The iodide of silver must then be filtered off and washed with alcohol of 0·86. The bromine and chlorine, not being soluble in the benzole, remain in the liquid and wash-water, and may be separated therefrom by the usual process.

Bromine.—This element is almost universally associated with iodine, so that where one is found the presence of the other may be suspected, and vice versa. I did not succeed in detecting even traces. My experiments were with Reynoso's effective test, which is based upon the fact that oxygenated water decomposes hydriodic or hydrobromic acid, but has no action upon the liberated iodine or bromine. A piece of deutoxide of barium having been placed in a test tube is to be drenched with ether, and a few drops of pure hyhrochloric acid and starch solution added; in a few moments the hydrochloric acid acts upon the peroxide of barium, oxygenated water is formed, and bubbles are evolved. At this time a portion of the clear and dense solution of 100 grammes of salt is added and mixed thoroughly by shaking. If bromine is present it is taken up by the ether, which rises to the surface colored yellow, while the iodine, its associate, remains as the lower stratum with the starch, and tints it blue.

Nitric Acid.—If the salt contains any nitrate it must be in very minute proportion, and happily there is a test for detecting traces. It is known as Higgins', and is founded upon the elimination of iodine from hydriodic acid by nitric acid, and its subsequent action upon starch. It is accurate to 0·0005.

The hydriodic acid is formed by the action of sulphuric acid on iodide of potassium. The test was prepared by dissolving an half gramme of iodide of potassium in distilled water; and in order that the liquor may not be strong enough to eliminate the iodine from the action of sulphuric acid alone, it must be diluted until its volume amounts to five fluid ounces. A portion of the clear and dense solution of 100 grammes of salt was then mixed with about one-tenth of its volume of

sulphuric acid heated on the sand bath *nearly* to boiling, for five minutes, then *perfectly* cooled in water to about 50° F., and heated with a drop or two of starch solution, and a few drops of the test liquid. The heat must be less than boiling, so that chlorine may not be generated to produce a blue color; but care must be observed to continue it for some minutes in order to insure the elimination of all the nitric acid; and the sulphuric acid solution should not be stronger than above directed, else it will produce iodine reaction in the most dilute solution of iodide of potassium, even without the presence of nitric acid. The sulphuric acid on the sides of the tube should also be washed down previous to the addition of the iodide of potassium.

A bluish tinge indicates the presence of nitrate, provided it becomes evident within twelve minutes, for a longer exposure to the air decomposes the hydriodic acid eliminated from the iodide of potassium, and sets free the iodine to color the starch. If the tint is not apparent in twelve minutes, the inference is no nitrate, for this test detects 0·0005, or less.

Boracic Acid.—This acid, though cautiously looked for, was not to be found. I followed the plan of strongly acidulating a very dense solution of the salt with hydrochloric acid, and then testing it with turmeric paper. After the paper had been immersed some thirty minutes, it was taken out and dried at 212° F. When borate is present, the paper on drying will assume a deep red or brown color; and as boracic is the only acid that thus colors turmeric paper like the fixed alkalies, this behavior is very reliable and exact, even to less than a thousandth.

Potassa.—As potassa salts are supposed to have a material influence upon the quality of commercial chloride of sodium, even when they are in minute proportion, care was observed to examine for the slightest traces. I, therefore, took the comparatively large quantity of 100 grammes, triturated it completely in a mortar with relays of common alcohol, and filtered the united liquors. Alcohol of that strength leaves the sulphate of lime and the most of the chloride of sodium with the insoluble residue. The clear filtrate was then treated in the usual manner, with alcoholic solution of chloride of platinum.

I prefer the above mode of dissolving out the potassa salt, for the reason that if an aqueous solution of the whole of the salt is first made, the alcohol added to insure the precipitation of the potassa—platinum chloride, simultaneously throws down much of the chloride of sodium, and the water used for washing it out takes with it also traces of the double chloride. More than traces we never found in any sample, but where the quantity is appreciable it must then be collected on a counterpoised filter, washed with dilute alcohol, dried in vacuo with the counterpoise, and weighed against it.

Copper and Lead.—A fluid once of freshly made and strongly impregnated sulphuretted hydrogen water was added to a portion of dense solution of the salt, and the whole left to repose some hours; but as no black precipitate ensued, the inference was that they contained no lead.

As both metals are precipitated black by sulphuretted hydrogen, it becomes necessary to dissolve the precipitated sulphuret in hydrochloric acid, filter, throw down the lead by sulphuric acid as sulphate, and then test the filtrate for copper.

Water.—The preceding constituents are rarely met with in larger quantities than traces, and this formula as to them has been rather more in reference to a qualitative examination; but water and all others that are henceforth noted exist mostly in weighable proportion, and consequently the process will now be both qualitative and quantitative, revealing in its progress any one if present, and estimating each as it is isolated.

Chloride of sodium does not contain any constitutional water or water of crystallization, but as found in commerce, is always more or less damp according to the care observed in the manufacture and drying of it. When the amount of moisture is large, it seriously depreciates the money value of the salt, and it becomes necessary therefore to estimate it very accurately. To this end one gramme of the finely powdered salt was gently heated in a platinum crucible with the cover on until decrepitation ceased, so as to prevent loss by ejection of particles. The cover being then removed, the heat was continued below dull redness for ten minutes, and the crucible and contents finally weighed. After having noted the weight, the crucible and contents were again heated at a little higher temperature than before, so as to be assured that every trace of water had been expelled, as is known when the second weight shows no loss on the first. By careful management and skilful regulation of the heat, the whole of the water is driven off even from the more retentive magnesian and lime chlorides, if they are present, without the volatilization or decomposition of the least portion of chloride. It is advisable, however, always to check the first result by a repetition of the essay with a new one-gramme portion of the salt.

Sulphuric Acid.—Chlorine and sulphuric acid were estimated exclusively from a new portion of one gramme. For this purpose it was digested in distilled water, filtered to separate insoluble matter, treated with slight excess of nitrate of baryta, left to repose for twelve hours for the entire subsidence of the precipitate, so as to facilitate a clear filtration, filtered and washed thoroughly with hot water. The filtrate was set aside as A. The filter suspected to contain phosphate and carbonate of baryta with the sulphate, was treated first with nitric acid and then washed with hot water to dissolve them out, and the washings set aside as B. The filter, C, was then dried, ignited, and weighed as sulphate of baryta, and the amount of sulphuric acid deduced from it by calculation.

Phosphoric and Carbonic Acids.—The filtrate, B, was then tested for phosphate with aqua ammonia perfectly free from carbonate, but as neither it nor sulphuric acid gave any cloudiness, the absence of baryta compound was evident.

Chlorine.—This element was estimated in the filtrate, A, by treating it with a solution of nitrate of silver in the usual manner.

If the preliminary essays have shown the presence of iodine or bromine, the proportion of these elements, respectively determined, as before directed, must be deducted from the chloride of silver, which, as before estimated, is always mixed with them.

Insoluble Matter.—The filtrate from the chlorine and sulphuric acid essays being mixed with excess of baryta and silver salts, which require tedious manipulation for their removal, it is useless for the estimation of the other constituents, many of which, moreover, are in such limited quantity as to require the large portion of ten grammes to give accurate results. This quantity of salt was therefore carefully weighed out and digested as before, to complete solution in distilled water, filtered and washed with hot water. The filter was D, and the filtrate, E. The former after being dried was ignited and weighed as insoluble matter, which consists mostly of silicates. The latter, or filtrate E, was covered with paper to prevent entrance of dust, evaporated to a very small volume, then acidulated with hydrochloric acid (which will produce effervescence if carbonates are present), and the evaporation continued to dryness, with caution against the admission of dusty particles from the air. After having cooled, it was re-digested with distilled water, filtered and washed with hot water. The filtrate, G, was set aside, and the filter, H, ignited and weighed as soluble silica.

Soluble Organic Matter.—If any soluble organic compound should exist in the salt, its acids, provided they are insoluble in their free state, will be eliminated at this stage of the process, and accompany the silica as dark floccula, which burn off during the ignition of the filter, and therefore leave the calx white. The proportion of them is rarely appreciable.

Lime.—The filtrate, G, was first treated with a little muriate of ammonia, and then supersaturated with carbonate of ammonia to precipitate the alumina and iron with the lime, while the magnesia would be kept in solution by the ammoniacal salt added and formed during the reaction. As carbonate of ammonia, when in excess, will retain a portion of the iron dissolved, and as it is very difficult also to produce an entire separation of the lime from the liquid owing to the probable formation of a little bi-carbonate from the decomposition of ammonia carbonate, this contingency must be provided against by evaporating the liquid to dryness, and then largely drenching with very dilute solution of oxalic acid instead of with pure water. Any excess of carbonate of ammonia is thus neutralized, and all the iron previously retained by it, as well as the lime, will fall. The whole was then filtered and washed, and after being tested with a drop of oxalate of ammonia and also of sulphide of ammonium, to be assured that all lime and iron had been separated, the filtrate was placed aside as K.

The filter, M, containing all the lime, partly as carbonate and partly oxalate, together with the iron and alumina, was displaced by pure hydrochloric acid. The filtrate was acidulated with a few drops of chemically pure sulphuric acid, and mixed with four volumes of 93 per cent. alcohol, filtered and washed with dilute alcohol rather than with distilled water, which will dissolve more or less of the sulphate. This sulphate after

being dried was ignited and weighed, and the lime thence calculated. It is necessary always to test the filtrates to be assured of the entire separation of the lime.

A shorter method of estimating the lime would be to precipitate it direct from the salt solution by sulphuric acid and strong alcohol, but chloride of sodium being more or less insoluble in the latter liquid, it goes down with the lime, and the large amount of water required to wash it takes up simultaneously some of the sulphate of lime, and thus leads to error.

The usual process of separating the lime from magnesia, alumina, and iron by oxalate of ammonia, would be too tedious and not very accurate; for as the solution is in the first instance acid, the necessary pre-addition of aqua ammoniæ to neutralize it so as to perfect the insolubility of the precipitated lime—oxalate would endanger the simultaneous deposition of a portion of the iron and alumina, which existing as they do in the salts in such minute quantities must be very cautiously and exactly estimated. Moreover, if any of the lime or magnesia exists as phosphate, the direct use of aqua ammoniæ will throw them down as such, notwithstanding the presence of ammoniacal salts. My reasons for estimating the lime as sulphate is because that combination is constant and not liable like the carbonate to change during ignition.

Iron.—The filtrate from the sulphate of lime containing the iron and the alumina with the excess of alcohol, was evaporated to dryness in a platinum capsule, ignited at low heat to drive off organic matter introduced by the alcohol, and which would otherwise interfere with the subsequent precipitation of the iron, dissolved in water, acidulated with hydrochloric acid, boiled in a silver capsule with pure caustic potassa ley, filtered and *thoroughly* washed with *hot* water. It was then dried, ignited, and weighed as peroxide of iron.

Alumina.—The alumina remaining in the filtrate was separated by neutralizing the excess of potassa in the latter with hydrochloric acid, adding a slight excess of carbonate ammonia, and warming for some hours on the sand bath. When the precipitated alumina had separated in flocculæ, it was filtered off, well washed with *hot* water, dried, ignited, and weighed.

Magnesia.—The filtrate, K, which in the interval had been evaporated upon the sand bath to one-fourth of its original volume, was first treated with ammonia and then with phosphate of soda. The vessel having been covered with paper, was left on the sand bath for some hours. It is always necessary to warm and to allow at least twelve hours repose, for when the magnesia is in minute quantity it will require that length of time for its separation, as it often happens even when liquids contain phosphate, they do not give immediate signs of its presence upon the addition of the re-agents. The ammonia phosphate was then filtered off, washed with dilute ammoniated water, dried, ignited, and weighed. The amount of magnesia was deduced by calculation.

No. 19 E. Twelfth St., New York, 1858.

Chemical Composition of the Commercial Varieties of

RANK.	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.
COMMERCIAL BRAND; and Source of the Specimen.	Key West Solar, Florida.	St. Martins.	Liverpool Rock.	Kiskiminitas, from Tarentum, Pa.	Oso.
Chloride of sodium,	0·993514	0·985266	0·982713	0·977931	0·975485
Water, ...	0·008000	0·007000	0·005000	0·019000	0·020000
Insoluble residue, . .	0·000050	0·002000	0·006000	0·000200	0·000300
Chloride of potassium, .	—	—	—	—	—
Chloride of calcium, .	0·000119	—	—	0·003017	—
Chloride of magnesium, .	0·000934	0·002123	0·002547	0·000849	0·002123
Sulphate of lime, . .	0·000554	0·000510	0·001700	—	0·001900
Sulphate of potassa, . .	—	—	S. trace.	—	—
Sulphate of soda, . .	—	0·002520	0·000659	—	0·001364
Nitrate of soda, . . .	trace.	—	S. trace.	trace.	—
Silicate of soda, . .	trace.	0·000336	0·000505	0·000252	0·000505
Organic matter, (soluble,)	—	—	—	—	trace.
Iron, ($Fe^2\ O^3$,) . . .	0·000800	0·000400	0·001100	0·000200	trace.
Alumina, ($Al^2\ O^3$,) . .		0·000200		0·000500	0·002000
Total, . .	1·003971	1·000355	1·000224	1·001949	1·003677

TABLE

RANK.	No. 14.	No. 15.	No. 16.	No. 17.	No. 18.	No. 19.
COMMERCIAL BRAND; and Source of the Specimen.	Spencer's boiled, from Syracuse, N. York.	Hope Factory, N. York.	Nassau.	Anguila.	Syracuse Company, N. York.	Tarentum, Pa.
Chloride of sodium,	0·962938	0·962851	0·960321	0·957348	0·956663	0·943494
Water, . . .	0·022000	0·014000	0·011000	0·022000	0·016000	0·040000
Insoluble residue, .	0·000300	0·000600	0·001000	0·005800	0·001800	0·000300
Chloride of potassium,	trace.	—	—	—	—	—
Chloride of calcium,	0·000009	—	—	—	—	0·007541
Chloride of magnesium,	0·002717	0·002123	0.008665	0·002293	0·000509	0·008491
Sulphate of lime, .	0·013992	0·016500	0·004800	0·008600	0·020000	0·002740
Sulphate of potassa,	—	trace.	traces.	—	—	—
Sulphate of soda, .	trace.	0·000667	0·009562	0·004410	0·002978	—
Nitrate of soda, .	—	—	trace.	trace.	—	trace.
Silicate of soda, . .	0·000168	0·000168	0·000673	0·000168	0·000168	0·000336
Organ. mat'r,(soluble,)	trace.	—	—	—	—	—
Iron ($Fe^2\ O^3$,) .	0·800800	0·000600	0·000500	0·000200	0·000700	0·000200
Alumina, ($Al^2\ O^3$,)	0·001700	0·002000	0·000500	0·001200	0·001300	0·000600
Total, . .	1·004624	0·999509	0·997021	1·002019	1·000118	1·003702

"Common Salt" or Chloride of Sodium. By Campbell Morfit. *One gramme.*

No. 6.	No. 7.	No. 8.	No. 9.	No 10.	No. 11.	No. 12.	No. 13.
Liverpool fine.	Liverpool ground alum.	Cudwell's boiled, from Syracuse, N. York.	N. York.	Kanawha Virginia.	Haskin's salina, coarse, from Syracuse, N. York.	Goose Creek, Kentucky.	Bonaire.
·969917	0·969423	0·968882	0·968488	0·967460	0·965540	0·964276	0·963288
·005000	0 011000	0·012000	0 012000	0·022000	0·014000	0·022000	0·017000
·000400	0·000700	0·000400	0·001100	0·000500	0·000600	0·000300	0·001000
—	—	—	—	S. trace.	—	S. trace.	—
—	—	—	0·002671	0·003257	—	0 007747	—
·006708	0·005774	0·000849	0·002547	0·002887	0·000509	0·001613	0·007132
·010005	0·003011	0·014300	0·015624	—	0·014500	—	0·004000
trace.	S. trace.	—	trace.	—	S. trace.	—	S. trace.
·004330	0·007628	0·003085	—	—	0·000809	—	0·006777
—	—	—	trace.	trace.	—	—	—
—	trace.	trace.	—	0·000421	0·000252	trace.	0·000168
—	—	—	—	—	trace.	—	—
·000500	0·000700	0 000400	0·000800	0·000400	0 000500	—	0·000500
·000600	0·000900	0·001200	0·000500	0 000400	0·001300	—	0·001700
·997460	0·999136	1·001116	1·003730	0·997325	0·998010	0 995936	1·001565

Continued.

No. 20.	No. 21.	No. 22.	No. 23.	No. 24.	No. 25.	No. 26.	No. 27.
Liverpool Ashton.	Turk's Island.	Pomeroy, Ohio.	Curacoa.	Alleghany saline, Penna.	Cadiz.	St. Ubes.	Inagua.
0·941656	0·940776	0·938382	0·929816	0·915437	0·913722	0·890402	0·878509
0·044000	0·032000	0·046000	0·053000	0·064000	0·063000	0·061000	0·096000
0·000500	0·003600	trace.	0·001500	0·000800	0·001700	0·001900	0·005000
—	—	S. trace.	—	—	—	—	—
—	—	0·008971	—	0·013495	—	—	0·004844
0·002462	0·007047	0·005095	0·011036	0·005394	0·010699	0·023870	0·000594
0·012200	0·009400	—	0·002300	—	0·003300	0·009800	0·013059
trace.	traces.	—	trace.	—	traces.	traces.	—
0·001262	0·007530	—	0·007208	—	0·009942	0·014475	—
—	—	—	—	—	trace.	—	trace.
0·000421	—	trace.	trace.	0·000505	0·000252	0·000337	0 000336
—	—	—	—	—	—	—	—
0·000200	0·001000	trace.	trace.	0·000200	0·000300	0 000400	0·000100
0·000200	0·000600	trace.	trace.	0·000200	0·000700	0·000500	0·000200
1·002901	1·001953	0·998448	1·004860	1·000031	1·003615	1·002682	0·998642

Safety for Steamers on Fire.

In almost every instance of destruction of steamers by fire, access to the engine has been cut off; and while the flames are driven aft, by the speed of the vessel, they have no means of obtaining water. Could not a syphon-like pipe be introduced, when the vessel is being built, extending the whole length of the same, through which the water would flow freely, so as to give motion, when necessary, to a hydraulic ram when required?

The highest part of the pipe should be well aft, and it should not be higher above the water line than the point to which the minimum speed of the vessel would cause the water to rise; cocks could then be attached at various places so as to draw water if necessary. E. B.

Brooklyn, New York, January 29, 1859.

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*Experiments on Vegetable Parchment.**

The following are the details of the experiments referred to in article on page 56.

WATER LEAF PAPER,

broke, when loaded with

I.	II.	III.	Mean.
17 lbs.	15 lbs.	15 lbs.	15·6 lbs.

VEGETABLE PARCHMENT,

broke, when loaded with

I.	II.	III.	Mean.
78 lbs.	75 lbs.	70 lbs.	74 lbs.

ANIMAL PARCHMENT,

broke, when loaded with

I.	II.	III.	Mean.
92 lbs.	78 lbs.	56 lbs.	75 lbs.

The strips of vegetable and animal parchment were selected as nearly as possible of equal thickness, but the strips of artificial product were somewhat heavier than those of real parchment. On an average, the former weighed 18 grains, and the latter only 12·75 grains. Calculated for equal weights, the strength of animal parchment as compared with that of artificial parchment, is obviously $\frac{18}{12·75} + 75 = 105$. In round numbers, it may be said that vegetable parchment has three-fourths the strength of animal parchment.

* From the Journal of the Society of Arts, No 313.

Discharge of Water by the Seine.

By means of the Pitot tube, the engineers have found that the quantity of water discharged by the Seine during the present summer, (1858) that is, at a very low level, is 45,592 litres (12,000 gals.) per second. In the month of October of last year, the river being some centimetres above its average, the flow measured at the bridge of Pecq was 102,332 litres (27,000 gals.) per second. *Cosmos.*

FRANKLIN INSTITUTE.

Proceedings of the Stated Monthly Meeting, January 20, 1859.

John C. Cresson, President, in the chair.

John Agnew, Vice President. }
I. B. Garrigues, Recording Secretary. } Present.

The minutes of the last meeting were read and approved.

Donations to the Library were received from the Royal Geographical Society, the Royal Astronomical Society, the Chemical Society, and the Society of Arts, London; K. K. Geographischen Gesellschaft, the Oesterreichischen Ingenieurs Verienes, Vienna, Austria; the Smithsonian Institution, and Charles Ellet, Jr., Esq., Washington City, D. C.; Hon. H. M. Phillips and Hon. T. B. Florence, U. S. Congress; B. H. Latrobe, Esq., and the Maryland Institute, Baltimore, Md.; Dr. B. A. Gould, Albany, New York; Charles B. Norton, Esq., City of New York; C. A. Walborn, Esq., Penna. Legislature; Prof. J. F. Frazer, Prof. B. H. Rand, John E. Addicks, Esq., and E. T. Freedley, Esq., Philadelphia.

The Periodicals received in exchange for the Journal of the Institute, were laid on the table.

The Treasurer's statement for December, 1858, and his annual statement for 1858 were read.

The Board of Managers and Standing Committees reported their minutes.

Candidates for membership in the Institute (3) were proposed, and the candidates proposed at the last meeting (141) were duly elected.

The Tellers of the Annual Election for Officers, Managers, and Auditors, for the ensuing year, reported the result, when the President declared the following gentlemen duly elected:—

John C. Cresson, President.

John Agnew, }
Matthias W. Baldwin, } Vice Presidents.

Isaac B. Garrigues, Recording Secretary.

Frederick Fraley, Corresponding Secretary.

John F. Frazer, Treasurer.

MANAGERS.

Samuel V. Merrick,	Thomas J. Weygandt,	James H. Bryson,
Thomas Fletcher,	Joseph J. Barras,	Ellis S. Archer,
Edwin Greble,	Joseph Harrison,	John M. Gries,
Thomas S. Stewart,	George Erety,	James Dougherty,
Alan Wood,	Evans Rogers,	George Whitney,
John E. Addicks,	Robert Cornelius,	Edward P. Eastwick,
Isaac S. Williams,	Lawrence Johnson,	Washington Jones,
George W. Conarroe,	William Sellers,	William H. Love.

AUDITORS.

Samuel Mason, James H. Cresson,
Samuel B. Finch.

At a meeting of the Board of Managers, held January 26th, 1859, the following officers were elected for the ensuing year:

Joseph Harrison, Chairman.

Isaac S. Williams, }
James H. Bryson, } Curators.

The attention of the President was called to the remonstrance against the introduction of gas-lighting, reported a day or two back in the daily papers as having been presented to the City Councils by himself and others in the year 1833.

In reply, he said it was true that he had signed such a paper, in company with several hundreds of his fellow citizens, and, moreover, that the statements there set forth as to the dangers and annoyances of gas manufacture were literally true at that day, he being able to testify, after personal inspection of nearly all the gas factories established prior to that period, that their condition was such as would cause them now to be considered intolerable nuisances; for the modes of manufacture and distribution were so imperfect, that gas was not thought fit to be admitted into private dwellings. The effect of the strong opposition to its introduction here, in that offensive manner, was such as to induce Councils to adopt the wise course of sending a competent agent to Europe to collect information on the subject and procure plans of all the best improvements there to be discovered. The person selected was Samuel V. Merrick, Esq., a gentleman admirably qualified for the mission, and he made such good use of his opportunities as to return in a few months with a fund of practical knowledge more extensive and complete than was then possessed by any other individual at home or abroad. He had been successful in obtaining access to all the principal gas works in England and Europe, with permission to examine fully their plans and processes, on condition that he should not publish nor reveal them to neighboring rivals. The various inventions and improvements thus discovered were combined for the first time in the plans for the Philadelphia Gas Works. They were of such value as to remove most of the serious objections to gas-lighting, and many of its former opponents, the speaker among them, united in recommending and promoting its immediate introduction, under municipal regulations, framed by the chairman of the special committee of Councils, F. Fraley, Esq., by which the city was effectually secured from any pecuniary risk, while retaining all needful control over the management of the enterprise.

If the actions of men are to be estimated by their results, then are these remonstrants entitled to approbation and grateful remembrance, not only in Philadelphia, but also in every place where gas is used; for the valuable improvements first exhibited in combination in the works constructed here, have been copied every where in the United States, both in works since founded and in those previously in operation, the latter having been entirely remodeled, and their engineers instructed according to Philadelphia methods. Nor have these benefits been confined to America; they have been returned to Europe, with

liberal additions to the improved plans originally derived from the older establishments.

With regard to the appropriateness of the comparison laid between this case and that of the railroad under argument, into which it was introduced, the speaker declined expressing any opinion, further than to suggest, that if the analogy intimated by the learned counsel by whom the remonstrance has been exhumed really exists, it would constitute a valid reason for pausing in our career of city railroads, until a general system can be matured on principles founded on public convenience, rather than the mere private interests of stockholders and speculators.

The discussion was closed with an allusion by the President of the Institute, who is also the Chief Engineer of the Gas Works, to some of the important regulations, originating here, for the security of gas consumers against the dangers and annoyances portrayed in the remonstrance. These have proved to be so well adapted to their purpose, that, after trial for nearly a quarter of a century, no reason has been discovered for making any material change in them.

Mr. A. C. Jones exhibited an apparatus (invented by himself and to be patented,) for weighing coal directly from the common coal cart. It is designed to supply a cheap method of weighing coal, or similar material, at the place of delivery. It consists of a scale arranged on a light frame, easily adjusted on curved bearings fastened to the top rods of the cart. This frame cannot be displaced by jolting, yet it may be slid up to the front of the cart, out of the way, when it is being filled.

Under the body of the cart a box is suspended by chains and hooks attached to a rod, passing across the cart, operated by a lever which in certain positions holds the box up firmly to the cart, so as to be carried safely over the roughest roads; puts it in place to be filled without injury to the scale bearings, or transfers the load to the scales to be weighed by a fixed small weight, representing a quarter of a "short ton," which may be changed to the "long ton," by placing a ring on the weight; the box is so suspended from the scale levers that it can be easily "tilted" with one hand, whilst the other relieves the hinged front of the box, and the load shoots out on the ground. By using a "prop" more than a quarter of a ton can be weighed at one time; but a quarter of a ton is believed to be the best size, as the few minutes extra required will more than be compensated for by rest to the horse, and also the whole apparatus may be so light as to be no drawback to its being carried with the load. When not required for weighing, the box and scale frame may be removed from the cart, to be replaced when wanted.

This scale will weigh correctly when one wheel of the cart is ten inches higher than the other, or if both wheels are in a deep gutter, thus giving the greater inclination to the cart.

Abstract of Meteorological Observations for November, 1858*; made in Philadelphia, Somerset, and Huntingdon Counties, Pennsylvania, for the Committee on Meteorology of the Franklin Institute.*

PHILADELPHIA.—Lat. 39° 57′ 28″ N. Long. 75° 10′ 28″ W. Height above the sea 50 feet. Prof. J. A. KIRKPATRICK, Observer.

November, 1858.	Barometer. Mean.	Barometer. Mean daily range.	Thermometer. Mean.	Thermometer. Daily oscillation.	Thermometer. Mean daily range.	Relative humidity. 2 P. M.	Force of vapor. 2 P.M.	Rain.	Prevail'g winds.
	Inch.	Inch.	°	°	°	Per ct.	Inch.	Inches.	Direc.
1	30·037	·191	58·0	18	4·3	45	·286		(var.)
2	30·011	·044	54·7	10	3·3	75	·350		N E.
3	29·926	·086	50·2	10	4·5	90	·348	1·067	S E.
4	29·806	·119	49·5	5	1·7	93	·348	0·051	(var.)
● 5	29·819	·060	49·7	7	1·5	73	·282	} 1·341	N E.
6	29·517	·302	49·0	9	2 3	93	·361		N E.
7	29·685	·168	48·2	19	5·5	49	·222		WSW.
8	29·670	·035	50·5	19	2·3	42	·202		S W.
9	29·677	·020	46·8	23	3·7	65	·233	0·007	N W.
10	29·814	·137	46·3	15	1·2	46	·172		WNW
11	29·916	·103	43·3	11	3 0	46	·153		N E.
12	29·901	·041	39·5	12¼	3·8	45	·129		N W.
☽ 13	29·661	·240	44·8	14¼	5·3	78	·283	0·044	S W.
14	29 957	·295	34·7	17	10·2	38	·090		WNW
15	29·828	·129	35·2	4	3·5	90	·191	0·200	S W.
16	29 781	·058	33·3	16	4·5	45	·103		N W.
17	29·873	·092	38·7	13	5·3	33	·102		WSW
18	29·864	·043	40·2	16	1·5	34	·111		WNW
19	29 891	·028	36·7	10	4 5	49	·125		N W.
○ 20	29·891	·083	37·0	18	4·3	48	·140		S W.
21	29·695	·196	40 2	6¼	6·8	91	·212	0·480	N.
22	29·776	·081	40·8	11	4·0	64	·193	} 1·515	N E.
23	29·527	·249	41·7	7	2·2	75	·208		WNW
24	29·625	·098	40·3	9	1·3	67	·186		W.
25	29·781	·156	37 7	10	2·7	49	·125		WNW
26	29 903	·122	36 7	13	1·7	42	·112		WNW
☾ 27	30·024	·121	38·3	12	1·7	42	·112		N W.
28	29·590	·435	34·7	9½	3·7	95	·201	0 469	N E.
29	29·647	·195	33 0	7½	1·7	80	·162	0·051	N E.
30	29·826	·142	37·0	15¼	4·0	43	·120		(var.)
Means	29·797	·136	42·2	12¼	3·5	61	·195	5·225	N 41 W.

SOMERSET, Somerset Co. Lat. 40° N., Lon. 79° 3′ W. Height 2195 feet. GEO. MOWRY, Observer.

November, 1858.	Barometer. Mean.	Barometer. Mean daily range.	Ther. Mean.	Ther. Mean daily range.	Relative humidity. 2 P. M.	Force of vapor. 2 P.M.	Rain and Snow.	Prevail'g winds
	Inch.	Inch.	°	°	Per ct.	Inch.	Inch.	Direc.
1	27·830	·132	46·7	2·3	58	·281		S E.
2	27·681	·149	47·7	9·0	92	·311	0·332	E.
3	27·660	·036	46·3	2 0	92	·323		E.
4	27·650	·013	45·7	3·3	80	·321		W.
● 5	27·568	·086	44·0	2 3	92	·298	} 1·274	E.
6	27·371	·197	42·0	2·0	55	·178		W.
7	27·450	·079	38·0	4·0	62	170		W.
8	27·470	·021	41 0	5·7	59	·220		S W.
9	27·497	·027	38·0	4·3	83	·221	0·063	W.
10	27 603	·106	35·7	2·3	90	·207		W.
11	27·670	·068	35·3	2·3	72	·165		S S E.
12	27·617	·053	35·7	1·7	57	·146		S W.
☽ 13	27·430	·184	33·3	5·0	90	·199	0·196	(var.)
14	27·677	·247	30·3	3·7	63	·144		W.
15	27·579	·098	28·0	3·0	100	167	0·140	N W.
16	27·598	·036	27·3	2·0	66	·120		W.
17	27·7[illegible]7	·129	26·7	0·7	95	·160		W.
18	27·676	·054	30 7	4·0	69	·142		W.
19	27·712	·036	27·3	4·0	94	·148		W.
○ 20	27·595	·123	26·0	6 0	66	·120		(var.)
21	27·427	·164	33·3	7·3	85	·176	0·086	W.
22	27·443	·079	31·0	2·3	74	·149	0·476	E S E.
23	27·284	·159	34·0	3·0	84	·169	0·092	W.
24	27 388	·104	30·7	3·3	100	·196	0·071	W.
25	27 645	·257	29·7	1 0	100	·181		W.
26	27·772	·127	28·3	2·0	78	·147		W.
☾ 27	27·732	·109	29·3	1·7	89	·175	0·453	WNW
28	27·236	·496	36·3	7·0	90	·199	0·731	W.
29	27·351	·163	34·3	4·0	73	·181		W.
30	27·626	·275	28·0	6 3	74	·149		W.
Means	27·565	·127	34·7	3·6	79	·192	3·014	

HUNTINGDON, Huntingdon County. JACOB MILLER, Observer.

November, 1858.	Barometer. Mean.	Barometer. Mean daily range.	Ther. Mean.	Ther. Mean daily range.	Rain and Snow.	Prevail'g winds
	Inch.	Inch.	°	°	Inch.	Direc.
1	29·500	·120	48·7	3·0		E.
2	29 413	·087	51·3	6·7	0·354	E.
3	29·395	·019	47·3	4·0	0·432	E.
4	29·312	·083	47·7	3·0		N E.
● 5	29·260	·057	47·3	3·0	0 226	N E.
6	29·038	·222	42·3	6·3	1·036	W.
7	29·102	·064	43·3	3·0		W.
8	29·130	·037	43·7	5·7		W.
9	29·157	·031	43·3	4·3		N.
10	29·301	·145	40·7	2 7		N.
11	29 361	·089	40·0	2·0		N.
12	29·295	·067	40·3	2 3	0·025	N.
☽ 13	29·085	·209	42·0	3·7	0 098	(var.)
14	29·385	·299	32·0	10·0		N W.
15	29·277	·107	32 0	1·3	(S.)	N.
16	29·280	032	30 0	4·0		W.
17	29·403	·122	35·7	5·7		N W.
18	29·362	·040	35·0	2·7		W.
19	29·414	·060	33·3	5·7		W.
○ 20	29·285	·129	30·7	8·7		N W.
21	29·124	·160	36·7	6·0	(S.)	S.
22	29·182	·115	37 3	1·3	0·387	E.
23	28·963	·218	37·0	1·0	(S.)	W.
24	29·075	·112	37·3	1·0		N W.
25	29·319	·244	36·3	1·0		N W.
26	29·483	·164	35·3	1·0		W.
☾ 27	29·441	·110	35·3	2·0	(S.)	N W.
28	28·950	·492	34·0	1·3	0·390	N W.
29	29·066	·170	35·0	1·0	0 018	N W.
30	29·311	·245	33·3	3·0		W.
Means	29·256	·135	38·8	3·6	2·966	

JOURNAL

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OF THE STATE OF PENNSYLVANIA,

FOR THE

PROMOTION OF THE MECHANIC ARTS.

MARCH, 1859.

CIVIL ENGINEERING.

For the Journal of the Franklin Institute.

Papers on Bridge Construction. By JOHN W. MURPHY, Civ. Eng. Philadelphia, Pennsylvania.

In beginning a series of papers on the theory and practice of bridge construction, it would seem most appropriate that the *arch* should first receive attention.

Among the ancient Romans, (who were essentially the first bridge builders,) the arch was made the primary feature of all their engineering and architectural constructions where the support of weights over spaces became necessary, and it has, indeed, ever since, been a favorite of the most distinguished engineers of every age, from the period of which I speak, to the present day.

I therefore propose to discuss the theory and practice of the construction of arch bridges when built in stone, iron, and wood.

The principles which govern the stability of the arch, are discovered by the investigation of two general problems.

1st, To find what weights will maintain the arch in equilibrium, when the line of pressures run parallel to the intrado.

Let A, K, M, Fig. 1, represent an arch which we may assume without error, to consist of the straight lines, M N, N O, O P, &c. And suppose that these lines are freely movable about the joints, M, N, O, . . K.

It is required to find what weights shall be placed on each joint, (a weight on any one joint being known or assumed,) so that the arch

shall be in equilibrium, and the joints, N, O, P, . . . K, remain in position at rest.

Represent these weights by N′, O′, P′, . . . K′, as they shall respectively act at the points, N, O, P, . . . K.

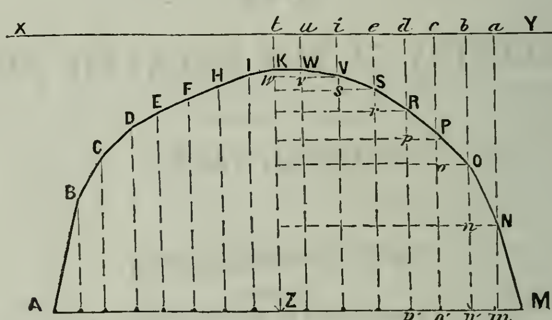
Draw the lines, N m, O n, . . . K w, in the direction of gravity, and the horizontal lines, m M, N n, O o, &c.

Now the pressure of all the superincumbent weights at and above N, will be conveyed to M, through the line N M.

And all above the joint O to the joint N, through the line O N.

Now the weight at N, acting in the direction of gravity, through the line N m, has its horizontal thrust at M $= m$ M, and the weight at O, in the same manner its horizontal component n N.

Fig. 1.



Now that the points, N, O, P, . . . K, shall remain in equilibrium depends upon the condition, that the weight of the superincumbent mass, acting at N, shall produce a horizontal thrust in the direction m M, equal to the horizontal thrust induced by the weights above O, acting at O; and in the same manner, the weights acting at P, shall produce a horizontal thrust in the direction o O, equal to that at m M; and equal to that at n N.

And per consequence that all the weights, N′, O′, P′ . . . K′, shall have such values, that the horizontal thrust shall be equal at each joint of the arch.

Now, by construction, we have given to the lines m M, n N, . . N m, O n, &c., values, for they are geometrical conditions of the arch. Hence, to form a general equation.

Represent any vertical line such as N m, O n, P o, &c., by a. Any horizontal line such as m M, n N, by b; and represent the horizontal thrust, (which, by condition of equilibrium, must be constant for every joint of the arch,) by h.

Then we shall have,

$$(K'+W'+V' \ . \ . \ . \ +N') : h :: a : b, \text{ or}$$

$$(1.) \ N' = \frac{a\,h}{b} - (K' - W' - V' - \quad);$$

which may be interpreted thus:—

The weight at any joint of the arch, as at K, W, O, . . N, *in order that equilibrium may be maintained, is equal to the length of the vertical line drawn from that joint to the intersection of the horizontal line drawn from the joint next below it. Multiplied into the horizontal thrust (which may be assumed at pleasure, but which must be constant for every joint).*

Divided by the horizontal distance of the next joint below intercepted by the vertical—minus the sum of all the weights applied above the point assumed.

It will be observed that the lines N M, N O, O P, &c., are the resultants of the *vertical weights* and *horizontal thrust* for each joint—and hence, the line of pressure of whatsoever material the arch may be constructed, will be parallel to the lines N M, N O, &c.

THE SECOND PROBLEM to be solved is to find the direction of the lines of pressure. When the weights above the points K, W, V, . . N, are known, the condition depending upon the horizontal thrust$=h$, being constant and the same for each joint.

Draw the line X, Y, and project the verticals to it—as at t, u, i, &c., represent by the distances t, K, u, W, . . a, N. The weight severally placed over the joints K, W, . . N, and let these weights finally as in equation (1) be represented by K′, W′, V′ . . . N′.

We will find from equation (1) a new line of *resultant pressures*, obeying the same law—as the fixed line M N, N O, . . W K. To describe this line divide for convenience the half span of the arch Z M, into any number of equal parts, this will make the value of b in equation (1) constant, and the same for every point N, O, P, &c., a and b, being the co-ordinates for the points N, O, P, &c., giving value to b, we find from equation (1)

$$(2.)\ a=\frac{(K'+W'+V'\ \ldots\ +N')}{h}\,b=m,\ N.$$

and in the same manner the value of a, may be found for any given joints as at O P. . . . K.

The constant value of h, in this last problem, must be determined from the weight K′, at the crown. This will be explained when we come to the practical part of our subject.

We have thus obtained two formulæ, the one expressing the ratio between weights or masses which shall be placed upon a given curve (or system of lines approximating to a curve), so that the curve may be maintained in equilibrium.

The other providing the co-ordinates (so to express it), which will describe a curve (or system of lines approximating to it), where the weights placed upon it may have any value.

I therefore propose to depend for principles in the construction of arches upon the two equations (1) and (2), knowing that they fulfil all the requirements of the practical Engineer, for whose benefit I am attempting to write.

(To be Continued.)

For the Journal of the Franklin Institute.

Solutions of some Topographical Problems, by "One Plane Descriptive Geometry." By John M. Richardson, B. S.

Topographical Problems.

Hills are most correctly represented by cutting them with a system of horizontal planes, and finding the projections of the curves of intersections. These curves are numbered, beginning at the lowest, or each one is marked by a number denoting its height above the lowest or datum plane.

The distance between the secant planes is dependent upon the accuracy with which it is necessary to delineate the surface. With any given distance between the secant planes, it is evident that the projections of the curves of intersection will be nearer together as the surface of the hill is steeper, and farther apart as the surface approaches nearer to horizontality.

The lines of intersection are called "contour lines," or "lines of horizontal section." The methods of determining these lines in the field and of plotting them, belong to Surveying, and cannot be explained here.

Problem I. Fig 1.—To find the intersection of a given plane with a given hill.

Let $(a, 0)$—$(b, 8)$ be the plane, and $(c, 0)$—$(d, 1)$—$(e, 2)$—$(l, 8)$ the surface.

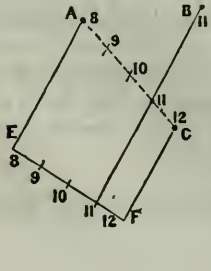
Through each point of division of the scale* of the plane draw a horizontal line in the plane, and find the points in which it intersects the curve of the surface which lies in the same horizontal plane.

The horizontal line through $(m, 4)$ intersects $(g, 4)$ in two points which are projected in r and r'. In the same manner other points of intersection are determined, and the curve is $n\ p\ q\ s\ r\ t\ u\ v\ w\ x\ w'\ v'\ u'\ t'\ r'\ s'\ q'\ p'\ n'$.

Problem II. Fig. 1.—The given surface being that of a hill, to compute the quantity of earth cut off by the plane and lying above it.

Divide the portion $q\ q'$ of the curve $(e, 2)$ into parts so small that they will not differ sensibly from their chords, and take corresponding parts of the curve $(f, 3)$. The trapezium whose projection is $c'\ d'\ e'\ f'$ may be regarded as coinciding very nearly with the surface of the ground, and $c'\ d'\ e'\ f'$ may be regarded as being the right-section of a small truncated prism whose lower base is in the horizontal plane, and

* The SCALE of a PLANE is a line divided into parts equal to the horizontal interval between the contour lines of that plane. The contour lines of a plane are of course all straight lines, and their horizontal intervals equal, since the inclination of a plane is the same in all parts.



The scale of a plane may be thus constructed. Let A, B, C, be three points in a plane, their heights above the datum being marked.

Draw A, C, connecting the lowest and highest points—divide in a number of equal parts equal to the difference of height between A and C. Through the point corresponding to the elevation of B draw B 11 and produce it—draw a line E, F, at right angles to B 11. The line E, F., divided as in the cut, and produced if necessary, is called the scale of the plane. It is nothing more than the line of greatest inclination of the plane crossing the contour lines at right angles and divided by them into equal parts.

We must bear in mind that only a plane can have a scale—that an irregular surface cannot.

whose upper base lies in the surface. That portion of this prism which lies above the cutting plane is required. It is evidently equal to the area $c'\ d'\ e'\ f'$ multiplied by the mean height of the four points $(c', d'\ 2)$, $(e', f', 3)$ above the cutting plane.

Knowing the scale according to which the diagram is drawn, it is easy to calculate the area of $c'\ d'\ e'\ f'$, and having the scale of the plane, the height of each of the points $(a', d', 2)$, $(e', f', 3)$ above it, can be readily found. From c' draw $c'\ c''$ perpendicular to the trace* of the plane, and if $\frac{m}{n}$ is the scale of the plane, $\frac{m}{n} \times c'\ c''$ is the height of the point in which the perpendicular through $(c', 2)$ pierces the cutting plane. Hence

$$2 - \frac{m}{n} \times c'\ c'' = \frac{2\,n - m \times c'\ c''}{n},$$ is the height of $(c', 2)$ above the plane.

Finding the height of each of the other points above the plane in the same manner, there results for there mean height above it,

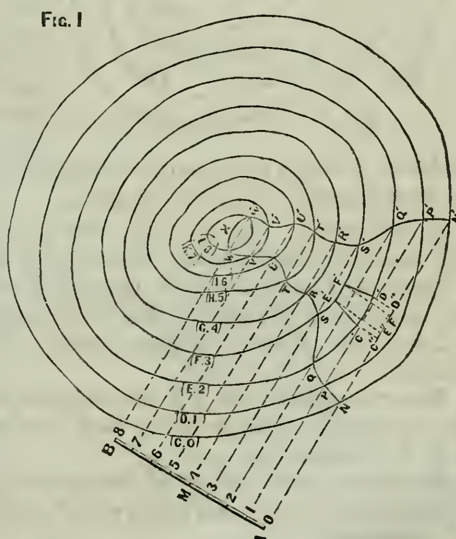
$$\frac{10\,n - m\ (c'\ c'' + d'\ d'' + e'\ e'' + f'\ f'')}{4\,n},$$

and for the volume of the truncated prism above the plane,

$$c'\ d'\ e'\ f' \times \frac{10\,n - m\,(c'\ c'' + d'\ d'' +'e'\ e'' + f'\ f'')}{4\,n}.$$

Finding in the same manner that part of each of the elementary truncated prisms which lies above the cutting plane and adding them all together, their sum will be volume cut off by the plane.

Fig. 1



Of course this is only an approximate solution, and is more or less correct according as the horizontal planes which determine the scale of the cutting plane and the horizontal contour lines of the surface, are nearer together or farther apart, and as the chords of the elementary curves correspond more or less nearly with them.

If the curves are very near in space, the chords of the elementary portions of their projections may be regarded as parallel, and $c'\ d'\ e'\ f'$ will then become a trapezoid.

Problem III. Fig. 2.—To draw a plane through a given line tan-

* The trace of a plane is its intersection with the plane of projection, and is of course a straight line lying in the plane of projection.

gent to a given hill, the plane to lie entirely above the surface of the hill.

Let $(a, 0)$—$(b, 6)$ be the line, and $(c, 0)$—$(d, 1)$—$(k, 6)$ the given surface.

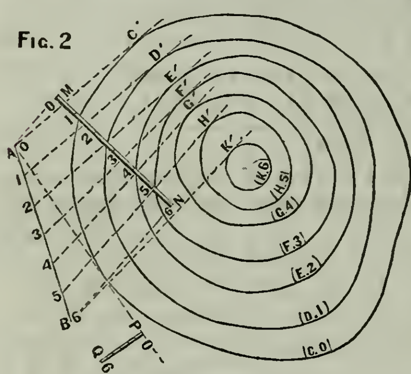
Through each point of division of the line draw horizontal lines tangent to the horizontal sections of the surface; $a\ e'$, $1\ d'$, $2\ e'$ and c., are their projections.

Then, the plane which passes through the given line, and that horizontal line whose projection makes the least angle with $a\ b$, (the angle being estimated from the projection towards the direction in which the line descends), is the required tangent plane, $a\ 5\ h'$ being the least angle, $5\ h'$ is the projection of a line of the required plane, and its scale will be perpendicular to $5\ h'$.

Drawing through a, 1, 2, 3, &c-, lines parallel to $5\ h'$, $(m, 0)$—$(n, 6)$ is the scale of the required plane.

It is evident that $(m, 0)$—$(n, 6)$ is a tangent plane; for if through m, 1, 2, &c., lines be drawn perpendicular to $m\ n$, none of them will cut the horizontal sections of the given surface, and one of them, $5\ h'$, is tangent to the section of the surface which lies in the same horizontal plane.

Fig. 2



It is also evident, that if planes be passed through the given line and the other horizontal lines which were drawn tangent to the horizontal sections of the surface, that they will all cut the surface. From a given point in the plane of a curve two tangents can generally be drawn to the curve; it follows, then, from the construction, that two planes can be drawn through the given line tangent to the given surface. $(p, 0)$—$(q, 6)$ is the scale of the other plane.

Problem IV. Fig. 3.—To draw a plane parallel to a given plane and tangent to a given hill, the plane to lie entirely above the hill.

Since the planes are to be parallel their scales will be parallel, and the intervals of graduation will be the same.

Let $(a, 0)$—$(b, 6)$ be the plane, and $(c, 0)$—$(d, 1)$—$(e, 2)$—$(k, 6)$, the surface.

Draw $l\ m$ parallel to $a\ b$, and tangent to the projections of the horizontal sections of the surface, draw lines perpendicular to $l\ m$, meeting it in the points m, p, q, &c.

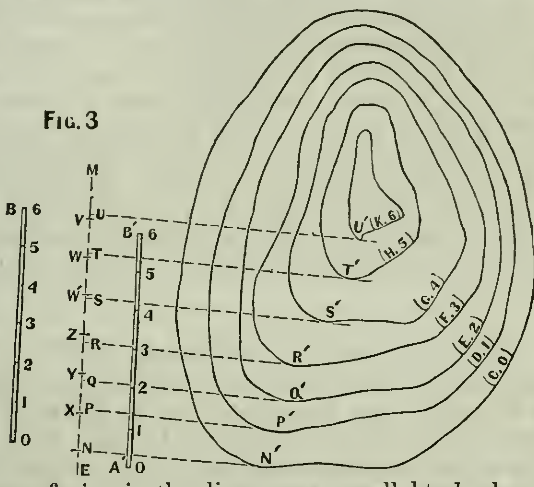
Beginning at the lowest of these points, lay off towards m distances equal to one of the equal parts of $a\ b$, and let x, y, z, &c., be the points of division.

These points will be in the scale of a plane drawn through $n\ n'$ parallel to the given plane, and will be at the heights 1, 2, 3, 4, &c., respectively.

But since this plane in rising from l to m, has a height (2) at the point y, it must pass below q, and therefore below $q\ q'$, and must cut the curve (e, 2), in some point. Hence it cannot be the required plane.

Commencing at p, lay off in like manner divisions equal to those of $a\ b$, and repeat the construction with respect to each of the points n, p, q, &c., until one is found from which the divisions being laid off all the points lie nearer to l than the corresponding points n, p, q, &c., at the same elevation. These will be the required points of graduation of the scale of the required plane. In the diagram, r is the point from which the divisions must be laid off.

FIG. 3

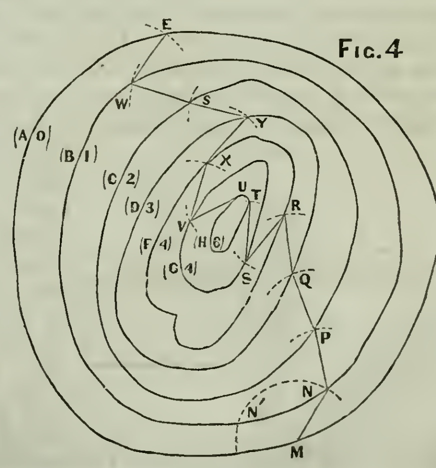


To avoid confusion in the diagram, a parallel to $l\ m$ has been drawn, and the scale is constructed on it. r' is the point of contact, and (a', 0)—b', 6 is the tangent plane.

PROBLEM V. Fig. 4.—To ascend a given hill with a given slope.

Let (a, 0)—(h, 6) be the hill, and $\frac{m}{n}$ the given slope. The secant planes being at the unit's distance apart, $1 \div \frac{m}{n} = \frac{n}{m}$ will be the length of the projection of that portion of the required line which joins any two adjacent contour lines, m being the point at which the ascent is to begin, with m as a centre, a radius equal to $\frac{n}{m}$ describe the arc of a circle cutting (b, 1) in m; in the same manner with n as a centre find p; then q, r, s, t, and $m\ n\ p\ q\ r\ s\ t$ will

FIG. 4



be the projection of the required line. If it is required to descend the hill so as to reach the bottom at a point as nearly opposite to m as possible, trace $(h, 6)$ to u, and with u as a centre and the same radius as before describe an arc cutting $(g, 5)$ in v; then find x, y, z, w, e, and $u\ v\ x\ y\ z\ w\ e$ will be the projection of the line of descent.

If the slope of descent should differ from that of ascent, the radius will be found by dividing 1 by the slope. The contour lines are supposed to be so near to each other that the surface between them may be generated by the motion of a right line resting upon both and remaining constantly perpendicular to one, or making equal angles with them both. The arc described from m as a centre, and a radius equal to $m\ n$ cuts $(b, 1)$ in two places, m' and n, and there may be two lines joining $(a, 0)$ and $(b, 1)$ which will fulfil the given condition. In the same manner it can be shown, that having found n' and n, four lines may join them with the next curve, all of which will fulfil the given condition. Hence quite a number of lines, all beginning at m, may be drawn which will fulfil the required condition. Although these lines all begin at the same point, they will not end at the same. In a case of practice, then, these lines, or several of them, should be examined in detail, and that one selected which actual examination proves to be best.

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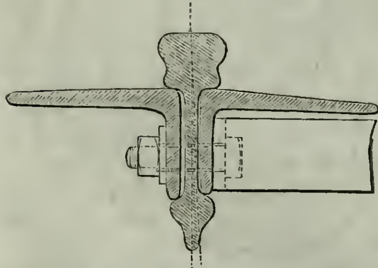
*Adams's System of Permanent Way.**

In February, 1856, an account was given in the pages of this *Journal* of a system of wrought iron Permanent Way for Railways, by Mr. W. Bridges Adams, denominated the Suspended Girder Rail. The testimony in its favor by several eminent railway engineers, and the practical experience since gained confirmatory of their opinions, together with its adoption for more than one important line, make it probable that this class of way will be ultimately preferred, wherever iron is considered imperative and timber inadmissible. Experiments are still going on to ascertain the minimum of bearing surface which will suffice, in order to keep down the weight and cost to the absolutely requisite quantity, and it is probable that a considerable reduction will be the result. For the purposes of export to India this is of great importance, as every ton weight averages thirty shillings for freight—about one-sixth added to the original cost of the materials. And wrought iron is in all structures a very considerable reduction of dead weight, with equal strength and greater security as compared with cast iron. The two sections hitherto applied are as follows:—Single-headed (Fig. 1) and Double-headed (Fig. 2).

Fig. 1.

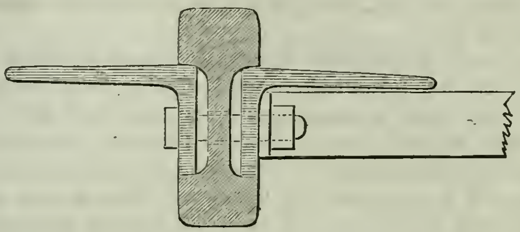


Meanwhile two of the highest Indian authorities—the East Indian Railway and the Great Indian Peninsular Railway—appear to consider

* From the Journal of the Society of Arts, No. 312.

the question of iron sleepers a most important point, judging from their half-yearly reports. The East Indian engineer states that the cast iron sleepers are a comparative failure, and that they are being removed into branch roads and sidings, and being replaced on the main line with timber sleepers. The Great Indian Peninsular engineer, on the

Fig. 2.



contrary, states that the destruction of timber sleepers is ten per cent. compared with five per cent. of the cast iron sleepers. In the absence of specific information as to the cause of failure, it is to be presumed that the failure of the cast iron is from breakage—a defect from which the wrought iron system is free—and the failure of the timber must be either from the white ant or from splitting by moisture and heat.

Structure has, no doubt, much to do with it, both in the case of iron and timber. A bad form of cast iron will ensure breakage even with a surplus amount of weight, and the mode in which timber sleepers are commonly used with double-headed rails, both in England and India, is not favorable either to the durability of the rails or timber.

The timber sleepers are usually ten inches in width, five inches in depth, and from nine to ten feet long. At each end of the sleepers is fixed down, by iron spikes or wood trenails, a mass of cast iron called a chair, now usually varying from 25 lbs. to 42½ lbs. each. In these chairs, the distance of which apart on the sleeper determines the gauge, are fixed the rails, the opening being sufficient to drop them in from above, and they are secured by wooden keys driven in laterally outside. The rail is composed of three members or portions, the lower table, the upper table, and the vertical web, which connects them together. The rail resting in the chair on its lower table acts as a prop to sustain the wheels. If the rails and chairs are always in contact, no blow will ensue, and when the upper table is worn out by work, it may be turned down, and the lower table will supply an unworn surface, with only the defect of a bad bearing in the chair, by reason of the worn surface of what was the upper table. But, practically, the running of the wheels causes lateral blows which crush the wooden keys, and the rails get loose in the chairs, striking a succession of hard blows well-known to passengers, crystallizing the texture of the rails, and destroying their upper surface by the blows of the wheels and their lower surface by blows on the chairs. All this is aggravated by the great elevation of the rails above the bearing of the sleepers on the ballast. The rail is five inches, the chair two inches, and the sleeper five inches, total twelve inches; thus any loosening of the wood key is aggravated by the height

of the prop, and a rocking motion ensues which disturbs the bearing of the sleepers, and in wet weather, lets in the water beneath them. To solidify the sleepers below, it is thus needful to dig out 12 inches of material to get at them, and this leaves loose ballast above when again filled in, which is disadvantageous in many ways. In this particular the wrought iron suspended girder is particularly advantageous. It is not requisite to open up the ground to get at it, and the upper surface is always firm and solid.

The principle of the wrought iron way, *i. e.*, suspending the rail from the upper table instead of propping it on the lower table, has, for a considerable time past, been applied to timber as well as to iron, and for those who think timber sleepers better than iron, the advantages, mechanical and economical, hereby attained, are very great. In the first place, as the rail is suspended by the upper table, it does not need one half the strength of the vertical web, but merely enough to hold the top and bottom tables together, as in an ordinary bridge girder. Consequently, weight can be saved in the rails, and at the same time their depth can be increased. An ordinary rail is five inches in depth, and as the strength of a beam is as the square of its depth 5×5 represent 25, whereas 6×6 represent 36, or one-half increase, and 7×7 represent 49, or nearly double.

In the side channels of these deep rails are bolted lateral timbers, four inches wide by four inches deep, by key bolts, three feet apart, making a total width of eleven inches. The rail is thus compounded of a central iron bar between two timber bars, which give it great lateral strength in addition to its own increased vertical strength.

The lower rails are connected together at the joints by brackets of wrought angle iron, bolted down to a cross-sleeper. If the rails are long, a central cross timber, four inches by four inches, is secured to the central key-bolts, and thus the gauge is secured.

In the ordinary cross-sleeper road there is a sleeper every yard, the full area of which is about seven and a half superficial feet, but the practical bearing is generally calculated at less than three-fourths. On the longitudinal plan the whole area may be reckoned, and therefore the area of the suspended plan is fully equal to that of the cross-sleeper plan, while the height of the rail is only four inches above the bearing, instead of twelve inches on the ordinary method.

When this plan was first proposed it was imagined that the small bearing surface of the rail on the timber by which it was suspended would crush in and destroy the timber; but calculation easily demonstrates the contrary. For instance, there are six chairs to an 18 feet rail; the bearing of each chair on the timber sleepers is about 48 square inches—total, 288. In the suspended method there is a width of three-quarters of an inch along each side of the rail, amounting to a total of 320 square inches,—and continuous.

But, it was argued, on the Great Western system of the bridge rail there are 1080 square inches in the same length, and yet it crushes into the timber. Quite true, but the reason is obvious. It is a shallow and not a deep rail, and it does not distribute its load over a long space

as does the deep rail. It crushes the timber in detail beneath the wheels.

The engineer of the North London Railway had faith in the system, and determined to lay down a few lengths on trial. The total width of the combined rail and lateral timbers was ten inches and a half, and the rails used were not deep, but the ordinary section of five inches—the total depth of the timbers being four inches. The rails were connected at the joints by cast iron angle brackets secured to cross-sleepers, and there was no intermediate tie, the length of rail being only fifteen feet. The result is given in the following report by the engineer:—

"The experimental length of the suspended rail laid on the North London Railway has now been down about twelve months. It was purposely placed in a situation exposed to the severest test which the line admits of, at the foot of a steep gradient, on a sharp curve, and at a station where numerous trains stop and pass through every hour.

"From the weekly reports furnished by the Company's inspectors, combined with my own occasional examination, I am able to state, with confidence, that the result of this trial has been very satisfactory in respect of durability and of economy. The original outlay is less than that required for the ordinary modes of construction, and the cost of manufacture is trifling, while the road is smooth and easy for the traffic."

On the North London Railway engines are used of thirty-five tons weight. Passenger trains are incessant, goods trains frequent, and with the exception that the speeds are not quite so great as on some other lines, it is one of the hardest worked lines in the world, and the use of brakes is very destructive. On the sample piece of line, the upper table of the rails being actually worn out, they were reversed, when the lower table was found as perfect as when new, and the timber was absolutely free from any wear or movement in those parts where the rail bore on it. When the bolts were taken out the timber remained fast in the recesses of the side channels, and it required force to get it out. It had become, as it were, cemented to the iron.

Since then, a portion has been laid down on the Eastern Counties line—the main line from Cambridge, near the locomotive sheds—where it has been examined by several engineers, and highly approved of. The movement is easier and smoother than on any other part of the line, though only the ordinary rails and not improved rails have been used, and the common sleepers cut down the middle have been used, instead of proper longitudinals.

We come, now, to the question of cost and comparison.

CROSS SLEEPER LINE.

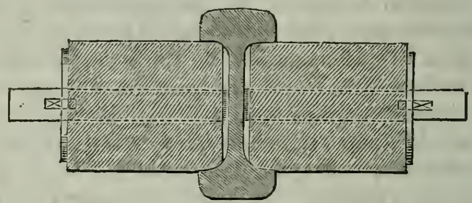
Quantities in a single mile.

		Tons.	Cwt.		£	s.	£	s.	d.
504 Rails, 21 feet long	70 lbs. per yard, 5 in. deep	110	0	at say	8	0	880	0	0
504 pairs Fishes	22 lbs. per pair	4	19	"	9	0	44	11	0
2016 Bolts		1	2	"	20	0	22	0	0
3520 Cast Chairs	28 lbs. each	44	0	"	5	0	220	0	0
7040 Spikes	1 lb. each	3	3	"	12	0	37	16	0
3520 Wood Keys				"	5	0	18	0	0
1760 Cross Sleepers creosoted	5 in.×10 in.×9ft, 4s. 6d. each	130	0	"			396	0	0
18864 Parts.		293	4				1618	7	0
	Freight to India at 30s. per ton,						439	10	0
							£2057	17	0

Suspended Rail on Timber Longitudinals.

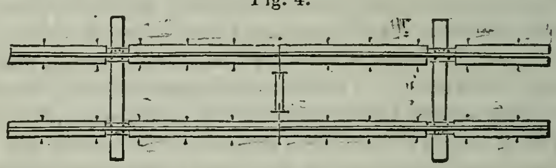
		Tons.	Cwt.		£	s.		£	s.	d.
504 Rails, 21 feet long .	65 lbs. per yard, 6 in. deep	102	3	at say	8	0		817	4	0
504 pairs Angle Joints, 1 ft. 6 in. long	28 lbs. per pair .	6	6	"	9	0		56	14	0
1008 Bolts for Angle Joints .	1½ lbs. each . -	0	13½	"	20	0		13	10	0
3520 Key bolts for timber .	2½ lbs. each . .	4	0	"	12	0		48	0	0
1008 Angle Joint Spikes . .	1 lb. each - .	0	9	"	12	0		5	8	0
1008 Timber Longitudinals . .	5 in.×4 in.×19 ft. 6 in. 56 loads	42	0	"	3	10	Load	196	0	0
252 Cross Sleepers . .	5 in.×5 in.×9 ft., 4s. 6d. each	19	0	"	3	10	do.	56	14	0
252 Wood Ties . . .	4 in.×4 in.×4 ft., 2 loads	1	12					7	0	0
8056 Parts		176	3½					1200	10	0
	Freight to India at 30 s. per ton, . . .							264	5	3
								£1464	15	3

Fig. 3.



The cross section and plan of the suspended rail are here given. It will be seen that to remove the rail it is not necessary to remove the timber, but only the joint bolts, both sides being alike. Fig. 3 is the cross section, Fig. 4 the plan.

Fig. 4.



	£	s.	d.
Assuming these prices to be correct, the saving on first cost by the improved system in England is per single mile, ...	£417	17	0
In India, taking the difference in freight; there is a saving of . .	175	4	6
Total saving, ...	£593	1	6

With a rail of one-half more vertical strength.*

If the same principle of side bolting be adopted with cast iron sleepers in the strongest mechanical section, as Fig. 5, the cost per mile will be—

	Tons.	Cwt.			£	s.	d.
504 Rails	102	3	at	£8	817	4	0
3520 Pairs cast Side Brackets . . .	100	0	"	5	500	0	0
4024 Key Bolts .3 lbs. each . . .	5	8	"	12	64	16	0
504 Tie Bars, 12 lbs. each . . .	2	14	"	12	32	8	0
	210	5			1414	8	0
Freight to India 30 s. per ton					315	7	6
					£1729	15	6

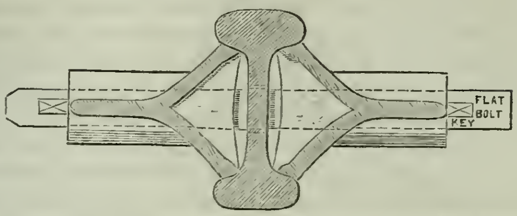
A sample of this has been applied on the South-Western Railway.

The saving in this mode as compared with the common system will be £326 0s. 0d. Cast iron can of course only be used in short lengths, and not continuously like wrought iron. The minimum ultimate cost of the wrought iron way is not yet ascertained, the reduction in scantling being still in course of experiment, but enough has been shown to

* The timber longitudinals may be applied in shorter lengths, break-joint if preferred.

induce those interested to institute a very searching inquiry into the whole matter.

Fig. 5.



In using the small scantling of timber, two obvious advantages arise,—lower cost of material, and greater facility for creosoting, if that process be applied. It will bring a simpler and cheaper class of timber into use for railway sleepers. This system is really lower in cost than the American system, which has been adopted from the temporary ways of English contractors, but with the advantages of a double-headed rail of less comparative weight, but really equivalent to two rails, the lower side remaining undamaged while the upper side is wearing out. And in addition to this there is a great saving in the depth of ballast.

The prominent distinction between the American system and the English system, is, that in England a double-headed rail is used, secured in a cast iron chair. The cost of these cast iron chairs, and their freight and transit rendered it necessary to dispense with them for poor lines, and in the absence of other knowledge, the double-headed rail was also dispensed with, and the flat bottomed rail of only half the service substituted for it. This new system of side bearers in the channels practically doubles the duration of the rails while diminishing the cost.

In considering the question of freight as an element in all distant Colonial lines when the material is supplied from England, India has been taken as affording the broadest comparison.

Russian Inland Navigation.

We are indebted to the *United States Railroad and Mining Register*, (Edited by Thomas S. Fernon, Esq., of Philadelphia,) for the following abstract from a very interesting account of the various systems of internal navigation, now in actual use in the Empire of Russia—Comprising *Canals, Slackwater Navigations, and River Improvements*—actuated or aided (in most cases), *by reservoirs of considerable magnitude.*

This comprehensive description has been derived mainly from official documents in the Russian language, and may (we understand) be fully relied on, *as authentic.*

The extensive and successful use which has been made of *Reservoirs* in that vast empire, not only to feed canals, but *rivers also*, cannot fail to be interesting to our readers, and may tend to remove from the minds of many, the objections which have been urged against the

employment of this grand and simple expedient, in improving the navigation of certain American rivers—or at least, may remove such objections as have been founded upon the idea that "*the Reservoir System of Improving Rivers*" was a new and untried plan.

While the great longitude and development of the Russian navigable systems, can hardly fail to excite surprise in this country, (where they are little known,) we cannot withhold our commendation of the skill and ingenuity evinced by the Russian engineers, not only in their choice of the most suitable materials in the various localities, but also in the admirable adaptation of the plans of their hydraulic works, to suit the circumstances of each case, so far as they can be gathered from the necessarily brief description before us.

This description of the Russian Inland Navigation, is divided into *three* chapters.

1. *On the artificial navigable communications leading towards St. Petersburg.*
2. *The artificial navigable systems* of the West of Russia.
3. The improvements made in the navigation of rivers.

In perusing these, we shall find strong evidence of a highly advanced state of the arts connected with hydraulics, and we may in this connexion, mention long lock chambers with *numerous sets of gates*, and *movable dams* in the rivers, as useful expedients, which in some places in our own country, it may be found advantageous to employ, to a greater extent than has yet been done among us.

I. *Systems of Artificial Navigation leading towards St. Petersburg.*

System of Vishney Volotchock.—The navigation of the Vishney Volotchock system begins at the Volga, thence ascending the Tvertza river it passes by the Vishney Volotchock canal into the Zna,* and continues down the Zna and Msta to lake Ilmen. In order to avoid the necessity of passing through this lake with the boats and the floats, two canals have been constructed, called the canals of Sievers and of Vishera. On leaving these canals the loads enter the Volkhof river and continue their descent to Ladoga lake.

The construction of the Vishney Volotchock canal, between the Tvertza and Msta rivers, was commenced in 1703. The navigation between the Volga and St. Petersburg was first opened in 1710. This navigation encountered at first great difficulties, occasioned not only by the want of water, but also by the defective construction of the sluices and other hydraulic structures.

In 1719 the works of the Vishney Volotchock canal being found to be much decayed, the re-building of them was entrusted to Michael Serdionkoff, a citizen of Novgorod, who at his own expense removed the different hydraulic structures, deepened the canals and rivers, and established reservoirs. As a remuneration for the expense he was thus subjected to, he was allowed various privileges for the establishment of mills and also of drinking shops or taverns for the people engaged in the naviga-

* The name of Zna is given to the upper part of the Msta river as far down as its entrance into the lake Mstino.

tion, and he was permitted to levy a certain toll upon the boats which traversed this system of navigation.

Serdionkoff improved the Vishney Volotchock system; at his death the administration passed to his heirs, who, in 1774, not desiring any longer to continue it, returned the control to the government.

The first improvement undertaken by the government consisted in the establishment of a lock, built of granite, at the exit of the river Msta from the lake Mstino; notwithstanding this improvement, the increase of the trade very soon demonstrated the insufficiency of the artificial resources of this communication.

The principal improvements in the Vishney Volotchock system were made in 1823 and 1826.

They consisted in the enlargement of the reservoir called the *Zavodsk reservoir*, situated in the vicinity of Vishney Volotchock, where a great mass of water is held in reserve, sufficient for all the wants of the most active navigation.

Among the more important improvements of this system must also be reckoned the establishment of elastic floats upon the Msta at the rapids of Borovitchi. These rapids extended for a distance of 20 miles, and in this distance the entire fall is 213 feet.

At the Borovitchi rapids the following difficulties are encountered in the navigation of the river:

A crooked channel between abrupt and stony banks, as well as stony capes or elbows, which project into the stream.

The bed of the river has a rapid inclination, and considerable shoals have been formed in it, which, together, produce violent eddies, and a great agitation of the surface of the water.

The bottom of the channel is uneven and stony, and the direction of the channel is very irregular, passing alternately from one bank to the other.

There are submerged bars covered with long stones brought and left there by the ice during spring floods.

There are bold vertical banks, which become separated from the main land in vertical layers, and threaten to fall into the river. There are islands in the channel of the river, which are not covered in a navigable stage of the water, and which separate the bed of the stream into several branches. With strong side winds, the barks are frequently forced out of the navigable channel into those which are not navigable.

The barks carried away by the force of the current, are often, in spite of all the efforts and skill of the boatmen, driven against the vertical banks and broken. It is for the prevention of such disasters, that the elastic floats have been established in the most dangerous places. The barks which strike against them rebound toward the channel without sinking, so that at present much fewer are lost than there used to be formerly.

At the present time the principal works of the Volotchock system are the following: A canal with a lock, built of granite masonry, between the Tvertza and Zna rivers. This canal is one mile and 4177 feet long and 70 feet broad at the bottom, the depth being about 8 feet.

The canal along the channel of the river Zna with two locks: one *in granite*, at the lower end, and the other *of wood*, built for the purpose of diminishing the consumption of water at the time the boats leave the canal. This canal is 3864 feet long, 70 feet broad, and two feet deep.

The Zavodsk reservoir is used part of the time in feeding the waters of the Tvertza, so that the fleets of barks *may ascend it* from Tver to Vishney Volotchock; afterwards the waters are turned into the lake Mstino and the Msta river *for the descent* of the same fleet of barks toward Novgorod.

The waste weir and flood-gates of Zavodsk reservoir, constitute one of the most important hydraulic works of the whole system. It retains in the reservoir a layer of water 17 feet in depth above the sills of the flood-gates, the superficial area of the reservoir being 14,873 acres.

In place of the old waste weir, the construction of which was rude and defective, and which was much out of order, the present new one has been built, which was finished in 1846.

In the plans for the new waste weir and flood-gates for the Zavodsk reservoir, every precaution has been taken for ensuring the stability of the structure and the resistance of the foundations, for, as has been stated, this is the important hydraulic work of the Vishney Volotchock system. The abutments and piers have been made of *wood*, not only for the purpose of diminishing as much as possible the expense; but most especially for the reason that repairs can only be made after the closing of navigation, that is to say, at the end of autumn, at which time the frosts of winter set in, and render repairs of masonry structures very difficult and uncertain, if indeed it is possible to execute them at all.

The granite lock of the Msta is placed at the head of that river where it leaves the Mstino lake, and where the boats and floats coming from Vishney Volotchock, are united into a fleet. The object of this lock is to retain the water which is drawn from the Zavodsk reservoir in the Mstino lake, as in a new reservoir, the influence of which in raising the waters of the Msta, is much more efficacious than that of the Zavodsk reservoir, on account of its greater proximity.

The Ossvuga reservoir is established near the Ossvuga river, where it empties into the Tvertza, and has a separate waste weir. The object of it is to assist in supplying the Tvertza with water while the fleet of barks is ascending it and to keep the flow of the stream regular.

The construction of a new waste weir was begun in 1842, and finished in 1843, so as to replace the one which previously existed, and which was in a very precarious state.

In selecting the position for the new waste weir of the Ossvuga, care was taken to avoid an inconvenience, which the old one presented, viz: that when the water was permitted to escape through the flood-gates, the current of the Tvertza, already very rapid, would augment considerably in velocity, and thus render the ascent of boats very difficult.

The reservoirs contiguous to the waste weirs of Doubkovka, Kametsk, Bairaizansk, and Ohversk, have been established for the Msta, with the same view as that of the Ossvuga for the Tvertza, that is to say, *to*

complete and regulate the supply of water from the great reservoir of Zavodsk.

The waste weirs of Ouversk and Doubkovka, have been built new, and that of Bairaizansk has been repaired as to its principal parts, in the years 1838, 1839, 1840, 1841.

The system of Vishney Volotchock, *where the navigation is fed by supplies of water artificially controlled*, is 400 miles long, from Tver to the commencement of the canal of the Vychera near the Msta.

For this distance the boats never navigate singly, but are united into fleets or caravans. Four fleets ordinarily pass in each year. About 4000 barks traverse this system annually, passing down the rapids of Borovitche and proceeding towards St. Petersburg. Their cargoes amount to about 514,286 tons gross.*

The vessels which are made use of for transporting cargoes on the Vishney Volotchock system, are principally arks, or flat-boats, 120 feet long and 28 feet wide, and conveying cargoes of from 100 to 130 tons. Their draft of water during the low stage of the rivers is about 21 inches, and in the spring as much as 24½ inches.

These vessels traverse the Vishney Volotchock system with considerably rapidity. The spring fleet, composed ordinarily of 1200 or 1400 arks, carrying from 177,000 to 193,000 tons, is occupied two months in going from Tver to St. Petersburg, a distance, by the water it takes, of about 666 miles.

Two canals, those of Sievers and of Vychera have been constructed for the passage of the arks from the Msta into the Volkhov, without entering lake Tlmen.

The canal of Novgorod, or of *Sievers*, was made for avoiding lake Timen, between the mouth of the Msta river and the commencement of the Volkhov river.

It was begun in 1797 and opened for navigation in 1804.

It is established on the same level with lake Tlmen, and consequently has no locks. It is 5·65 miles in length; its breadth on the bottom is 70 feet; and boats can traverse it with a draft of water equal to 5 feet. The canal begins on the Msta 6 miles from its mouth, and passing through low grounds, which are submerged by the spring floods of the lake, it ends at the outlet of the Volkhov river.

The canal is consequently liable every year to be obstructed with alluvial deposits, which render its navigation difficult in the spring during the prolonged inundations of the Tlmen.

These inconveniences of the Sievers canal, joined with the stoppages to which the arks are liable at the point where they leave the canal to enter the Volkhov, having induced the government to construct between the Msta and the Volkhov another canal now called *the Vychera canal.*

The Vychera canal has therefore also been constructed for the purpose of avoiding the Tlmen lake, and it passes from the Msta to the Vychera, which falls into the Volkhov river.

It was begun in 1826 and opened for navigation in 1836.

It has no locks, but it is closed at the end next the Msta *by a movable*

* In all cases the ton spoken of is the gross ton of 2240 pounds.

dam or waste weir, with granite sluice with abutments and moveable planks, which are put up for a short period in the spring for the purpose of preventing the spring flood, which occurs sooner in the Msta than in the Volkhov, from passing through it. The canal is $9\frac{1}{3}$ miles long and its breadth on the bottom is 38 feet.

The canal commences at the borough of Bronnitzy on the Msta, 16 miles from its mouth, and ends at the Vychera, which falls into one of the branches of the Volkhov, called the little Volkhovets. In consequence of the clayey texture of the soil, the banks of the canal have been revetted.

The breadth of the Vychera canal does not permit the arks to pass each other. In determining the dimensions of the canal, they were made as small as possible for the purpose of diminishing the amount of earthwork, having in view the fact, that by far the greater part of the arks which were to traverse the canal would pass from the Msta towards the Volkhov. But there are also boats, though very few in number, which go from the Volkhov to the Msta, and in order that they may not interfere with the movements of the fleets, *small side basins* have been dug in the bank of the canal, where these boats can stop so as to leave the middle free. Boats can navigate the Vychera canal with a draft of water of 3 feet.

The canals of Sievers and Vychera, have therefore both been constructed for the same purpose, that of avoiding the necessity of entering lake Tlmen with the arks, which thus are enabled to pass from the Msta into the Volkhov and down the latter stream to Ladoga lake.

Ladoga lake is stony and its bottom is covered with large stones; with head winds the navigation is tedious and even dangerous. Moreover the vessels on the lake do not navigate the Vishney Volotchock system, and the arks, which arrive at the Ladoga by the Volkhov, cannot, in consequence of the manner in which they are constructed, continue their navigation upon the lake. For these reasons the Ladoga canal has been built, for the purpose of enabling boats to pass from the Volkhov into the Neva, without entering the lake.

The vessels, which pass through the systems of Vishney Volotchock, Tykvine, and Marie, all pass through the Ladoga canal to reach the Neva, and for this reason the description of this canal should come after those of the three systems.

(To be Continued.)

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*Cornish Engines.**

The number of pumping engines reported this month is 16. They have consumed 982 tons of coal, and lifted 7,400,000 tons of water ten fathoms high. The average duty of the whole is therefore 51,000,000 lbs. lifted one foot high by the consumption of 112 lbs. of coal.—*Lean's Engine Reporter*, 23d *November*.

* From Herapath's Journal, No. 1017.

AMERICAN PATENTS.

List of American Patents which issued from December 14, 1858, to January 11, 1859, (inclusive,) with Exemplifications.

DECEMBER 14.

50. Stencils; Robert A. Adams, St. Louis, Missouri.

Claim—The preparation of the "stencil" blank, in the manner described, to wit: in oil shellac and glue, applied as set forth; also, the application of the sand or emery to the back of the "stencil," in the manner described.

51. Sewing Machines; J. E. Atwood, Mansfield Centre, Connecticut.

Claim—The combination of the vibrating arm which carries the dog, its attached arm, the swinging frame, the independent levers, the springs, and the cam.

52. Wrist-band Fastener; Daniel S. Baker, Providence, Rhode Island.

Claim—The spring firmly attached to the front of the fastener in its application to the heel, by means of a shoulder and the end, in such manner as to form a perfect fastener, and easily operated upon.

53. Sewing Machines; Amos H. Boyd, Saco, Maine.

Claim—The combination of the looper, the bars, B and C, and cam wheel, when constructed as described.

54. Stoves; John S. Clark, Philadelphia, Pennsylvania.

Claim—The movable plate as it is arranged with, and has relation to, the grate, the usual back plate, the air passages, and the passage for the products of combustion, as set forth.

55. Stoves; John S. Clark and Washington Harris, Philadelphia, Pennsylvania.

Claim—Combining with the adjustable air passages at the top of the interior cylinder or lining, the section of the hollow annulus with perforations, its lower edge resting upon the inner edge of the lining, and its upper edge against the shell plate, and thus forming an air chamber, as set forth.

56. Tea and Coffee Pots; Stephen Culver, Newark, New Jersey.

Claim—1st, The leach, composed of the receptacle, the canister, and the tube or siphon. 2d, The combination of the reservoir with the leach. 3d, The diaphragm with the steam orifice, and the combination thereof with the receptacle of the leach, in the manner described.

57. Excavators; S. S. Curtis, Croton Corners, New York.

Claim—The combination of the eccentric scoop with the adjustable gauge-stops and braces, or their equivalents, arranged in the manner set forth.

58. Railroad Brake; Wm. Edge, Downingtown, Pennsylvania.

Claim—The application to railroad cars of a vertical self-acting safety car brake, consisting of a flanched safety block, cam wheel, axle, lever, chains, connecting rods, bumper, wheel block, pedestal, and shafts, combined as described.

59. Air Engines; John Ericsson, City of New York.

Claim—1st, The system of levers, rock shafts, and connecting rods, or its equivalent, for combining the supply and working pistons with the crank shaft of the engine, to produce the operation specified. 2d, The ring, the notches, check pins, and the elongation of the supply piston, or their equivalents, for effecting the required transfer of the air to and from the heater, and the cooling of the cylinder and preservation of the packing of the working piston. 3d, The telescopic tube applied within the working cylinder and its prolongation, by means of which tube the air is brought in proper contact with the heating surfaces.

[This invention consists in so constructing, arranging, and actuating the supply and working pistons, within a single cylinder, that the cold supply air in being transferred to the heater for the purpose of having its tension augmented, shall cool that portion of the cylinder in which the working piston moves, and keep it at so low a temperature that any kind of metal, or any other suitable material, such as leather, may be employed to keep the piston air-tight. In order to effect this, the working and supply pistons are connected to the crank of the fly-wheel shaft by a system of levers, rock shafts, and connecting rods, of such a nature that an alternating, accelerated, and retarded reciprocating movement will be imparted to the two pistons, capable of effecting the desired transfer of the air and cooling of the working cylinder, and at the same time to produce motive power. The invention further consists in placing the heater within the working cylinder, or a prolongation thereof, and in conveying the supply air from the cold end of the cylinder to the opposite end by such means that every particle of the air to be heated is made to traverse the entire length of the heater.]

60. Car Seats and Couches; G. W. Fairfield, Holyoke, Massachusetts.

Claim—The combination of the flexible backs with the curved grooves and the sliding beam, so that the backs may be brought into a horizontal position.

61. Water Wheels; John H. Fairchild, Jericho, Vermont.

Claim—The single wheel, in combination with the draft tube, said wheel being placed within the penstock, and arranged either horizontally or vertically with said tube. Also, the annular gate placed within the sliding frame in connexion with the adjustable plate, arranged substantially as described.

62. Feed Water and Blow-off Apparatus for Steam Boilers; Jacob Frick, Philadelphia, Pennsylvania.

Claim—Combining an air vessel, having cocks and branches, arranged with the feed and blow-off apparatus, for which Letters Patent of the United States were granted to me on March 18, 1856.

63. Compositions for Tanning Leather; Wm. W. Gaige, Rochester, New York.

Claim—The use of salt and sal-soda in the proportion specified for a preparatory liquor. Also, the combination of starch and catechu in the proportion specified, for the second or first tanning liquor. Also, the combination of starch, catechu, and saltpetre, in the proportion specified, for the third liquor. Also, the combination of starch, catechu, and alum, in the proportion specified, for the fourth liquor.

64. Machine for Making Hollow Bullets; Richard Gornall, Baltimore, Maryland.

Claim—1st, The employment, in combination with a punch and a set of dies, or their equivalents, for pressing blanks or pieces of lead into a form approximating more or less to the desired form for hollow bullets of a revolving core, serving, firstly, to produce the cavities in the bullets, and, secondly, as a mandrel to revolve them, for the purpose of finishing their exteriors by turning them. 2d, The employment, in combination with the revolving core, of a turning cutter operating automatically. 3d, The employment, in combination with the revolving core and turning cutter of a female centre, operating substantially as described, for the purpose of securing the bullets on the core during the turning operation, and liberating them after such operation.

65. Steam and Water Alarm Gauge for Steam Boilers; George W. Grader and Benjamin F. Cowan, Memphis, Tennessee.

Claim—The combined arrangement of the two valves, F I, and their seats, the several chambers and passages, the valve levers and their connexions within the case, A, substantially as described, whereby the construction of the instrument is rendered simple, its form compact, and its size limited without the use of stuffing boxes, or any packing.

66. Machinery for Forming Hat Bodies; Michael Hardy, City of New York.

Claim—Combining a pervious cone, connecting with an exhausting apparatus, a picker or brush of a conical form, substantially as specified. Also, in combination with the pervious cone and conical picker or brush, the apron formed and mounted as described, for supplying fur to the several parts of the length of the picker in proportion to the diameter. Also, in combination with the pervious cone and conical picker or brush, the employment of a series of rollers forming a concave to direct the fur toward the cone. Also, in combination with the two cones, the one on which the bat is formed, and the other fitting over the bat, the tube connected with the exhausting fan and adapted to receive and hold the outer cone, to effect the transfer of the bat of fur fibres from the inner to the outer cone, as set forth.

67. Steam Radiators; John Henry Holt and Josiah H. Gerould, Chicago, Illinois.

Claim—The combination of the wire gauze burner and its vapor hood applied to the self-acting boiler, connected as described, with the steam condensing cylinder and its reservoir, air cocks, and safety and vacuum valves, and its tubes and radiators, M, with their ends open in the apartment to be heated, and governed by the gas regulator; which combination produces a new and improved self-acting and self-regulating apparatus for raising the temperature of any given apartment in which it may be set up by radiation from surfaces heated by condensation of steam generated by the flame of combustible gas.

68. Harness Snaps; B. B. Hotchkiss, Sharon, Connecticut.

Claim—Securing the spring to the snap hook by means of a collar so constructed and applied as to press against the broad end as well as the faces of the spring.

69. Car Brakes; Joseph Hough, Buckingham, and Jacob Moore, Bart, Pennsylvania.

Claim—The arrangement and combination of the slides and levers, as described.

70. Car Springs; Charles R. Hurlburt, Seymour, Connecticut.

Claim—The combination of the two kinds of disks, plane and raised with the rings, when the whole is constructed and arranged substantially as described.

71. Bandages; N. Jensen, Washington City, D. C.

Claim—Forming instruments of two wire springs, a and g, the spring, g, which supports the bag, being hinged and hooked to the other spring, a.

72. Folding Table; Charles Lammrich, City of New York.

Claim—The folding legs, combined with and hinged on to the bed or top of the table, in the manner specified.

73. Sled Brake; Albertus Larrowe, Cohocton, New York.

Claim—The arrangement of lever, scrapers, and rods, operating as described, for the purpose of a self-acting brake, and self-relieving and backing the sled.

74. Engine Hose; Charles Lenzman, Brooklyn, New York.

Claim—The hempen hose woven, saturated, and covered, as described.

75. Folding Chair; R. McG. Lytle, W. G. Alston, and Lorenzo W. True, Williamson Co., Tennessee.

Claim—1st, The arrangement of the arms and also of the back, so that the back retains the arms in place when folded. 2d, The arrangement of the legs so that one set of legs folds over and retains the other set in place. 3d, The combination of the slotted bolt with the socket plate and spring stop, arranged for connecting the arms with the seats. 4th, In combination with the side bars, the screw strap, or its equivalent, for connecting the bars with the legs, so that when folded between the legs, one is raised and the other depressed for the purpose set forth. 5th, Connecting the legs with the seat by means of a socket joint, arranged so that each pair of legs can be withdrawn from their sockets and folded down, without being disconnected from each other or from the seat.

76. Shower Baths; Joseph Mansfield, Jefferson, Wisconsin.

Claim—A shower bath having chambers, tubes, and stop-cocks, substantially as described.

77. Breech-loading Cannon; Edward Marshall, City of New York.

Claim—1st, The employment of the adjustable chucks, constructed in the manner set forth. 2d, The recesses made from the outside of the gun into the bore, for the purpose of containing and concealing the chucks. 3d, The combination of the chucks with the pin, constructed substantially in the manner described. 4th, The arrangement of the pin, the collar, and the screw, substantially in the manner specified. 5th, The employment of projections for the purpose of securing and concealing the handles of the can.

78. Children's Carriage; Gilbert Maynard, Greenfield, Massachusetts.

Claim—Connecting the axle with the tongue by means of the peculiarly formed rods, which also serve as springs for the vehicle, as described.

79. Stair Sweeper; F. H. Moore, Boston, Massachusetts.

Claim—1st, The combination of the box and brush with the dust-pan, arranged as described, whereby the dust is prevented from escaping, 2d, And in combination with the above, the curtain, operating in the manner specified.

80. MACHINE FOR TURNING IRREGULAR FORMS; Z. F. Nance, Richmond, Virginia.

Claim—Passing the piece to be turned through the pattern, and the combination of the same with the swinging frame and parts connected therewith, as set forth.

81. STEAM BOILERS; Charles J. C. Peterson, Davenport, Iowa.

Claim—Arranging the feed pipe in such a manner under the fire-box, that the same, in combination with plates, placed between the bends of the feed pipe, constitutes the bottom of the ash-box, so that the feed water running through the pipe is heated by the ashes, said plates being so arranged that they can be raised and actuated by cranks and levers, so as to leave room for the ashes to escape.

82. ADJUSTABLE CARRIAGE SEATS; Henry H. Potter, Carthage, New York.

Claim—Attaching the seat to the body of the vehicle, as shown, or in any equivalent way, so as to admit of the seat being turned obliquely with the body, either to the right or left, for the purpose set forth.

83. ESCAPEMENT FOR TIME PIECES; George P. Reed, Roxbury, Massachusetts.

Claim—The improved escapement as constructed with its two impulse cams, or a double impulse pallet applied to the balance wheel axle, and to operate with the escape wheel, in combination with the double detent lever, lifting reverse cams or pallet applied to the detent lever of the escape wheel, and operated by a cam screw, or its equivalent, supporting the axle of the balance, essentially as explained.

84. STEAM GENERATORS; Robert E. Rogers, Philadelphia, Pennsylvania.

Claim—1st, The arrangement of the coils, constructed as described, the one being concentrically within the other, the annular spaces between the successive coils constituting direct and separate, and the only passages and outlets for the products of combustion, the entire lower portion of every coil having fire underneath it. 2d, The arrangement of the feed water pipe and the air feeding pipe in relation to each other and to the generating coils, whereby I am enabled to introduce the water in graduated quantities into the upper part of the coil, and use atmospheric air to force the water over or upon the heated surfaces. 3d, Imbedding the lower portion of each of the concentric coils in cast iron, cast around it to a greater or less height, for the purpose of protecting the coils from high degrees of heat.

85. FURNACES FOR EVAPORATING SUGAR JUICES; F. Roy, Parish of St. Bernard, Louisiana.

Claim—The setting of sugar kettles with the system of radial braces, so situated as to divide the space around the kettle into two apartments, communicating by the openings, when these upper chambers communicate with each other and by flues with a common flue, the whole operating as set forth.

86. FORCEPS FOR FASTENING CLASPS ON HOOP SKIRTS; George D., Samuel A., and Charles S. Russell, Birmingham, Connecticut.

Claim—The pliers having their jaws provided with recesses and lips, and with a lever or wedge-like attachment to operate in combination with the said lips.

87. BEE HIVES; Joseph D. Sanderson, Stetson, Maine.

Claim—The holes in the back of the hive communicating with the grooves in the doors, and the grooves in the under side of the top of the box, in connexion with the boxes provided with perforated plates, whereby the hive is perfectly ventilated, and the rain excluded.

88. GAS BURNING STOVES; Thomas Shaw, Assignor to self and C. S. Patterson, Philadelphia, Pennsylvania.

Claim—1st, The inverted cone, when arranged within and in respect to the hollow cylinder, and connected to the gas pipe, substantially as set forth. 2d, Extending the gauze disk beyond the opening for the passage of the gas, and so arranging the overhanging portion of the said disk that it shall be exposed to the air. 3d, The construction of the oven, consisting of the inverted box, its opening, and lining, and the inner cylinder, the whole being arranged to form the intervening passages, for the purpose set forth.

89. HARVESTERS; Oren Stoddard, Busti, New York.

Claim—The conical rollers, two or more, attached to the finger bar, in connexion with the sickle bar provided with an inclined back, and the cap plate, or its equivalent, the whole being arranged as set forth.

90. NUT MACHINES; Julius B. Savage, Southington, Connecticut.

Claim—The employment or use of the cutter, dies, and punch, in connexion with the conveyors, adjusters, and the jaws, or their equivalents, arranged as set forth.

91. WATER GAUGES FOR STEAM BOILERS; Thomas Stubblefield, Columbus, Georgia.

Claim—The combination of a float, a secondary valve, and a main valve, as set forth. Also, the method of preventing a too sudden opening of the main valve by insulating (in a chamber, or its outer side, exposed to the air) a quantity of steam.

92. ATTACHING CARRIAGE THILLS TO AXLES; John W. Sibbett, Cincinnati, Ohio.

Claim—The plate and socket or tube attached to the clip, in connexion with the pin attached to the thill, and the hook provided with a shank, and nut, and ratchet, the shank of the hook being fitted in the tube, and the ratchet having a pawl catching into or engaged with it, as set forth.

93. FLUID METRES; Charles Wm. Siemens, London, England; patented in England, March 4th, 1853.

Claim—1st, The construction of rotary fluid metres with a revolving wheel or drum, having tangential or oblique apertures, and connected with a counter, and inclosed in a fluid-tight case, and so arranged that the fluid to be measured flows from the centre towards the circumference of the wheel or drum. 2d, The application to rotary fluid metres of retarding vanes, substantially in manner described. 3d, Constructing the revolving part or wheel of a fluid metre and the fixed part or pipe which introduces the fluid into it, with two or more collars or flanches on one or both of the said parts, so as to check the passage of the fluid by the producing of eddies. 4th, Supporting the wheels or revolving parts of fluid metres by means of a flat or hollow plate or cap of steel, or other suitable material, attached to the wheel, and resting upon a fixed pivot, and combined with an oil chamber. 5th, Constructing fluid metres with a revolving wheel or drum having tangential or oblique apertures and retarding vanes, and provided with an oil chamber and pivot, and connected to a counter, and inclosed in a fluid-tight case. 6th, Constructing fluid metres with a dirt-box or strainer, arranged so that it may be opened and the dirt removed without disturbing the metre or the pipes. 7th, Constructing fluid metres with the wheel work, or a portion of the wheel work, of the counter, inclosed in an oil chamber which is exposed to the pressure of the fluid in the metre, substantially as described.

94. CULTIVATORS; Thomas Turner, Marysville, Ohio

Claim—The combination of the pulverizing mould board and hilling mould board, constructed as shown, and attached respectively to the longitudinally and laterally adjustable beams.

95. Adjustable Cradle for Dry Docks and Marine Railways; Washington Van Dusen, Philadelphia, Pa.

Claim—The combination and arrangement of the cradle bars, jointed, connecting, and sliding bars, chains, and sliding lifting screw blocks, respectively connected together and to the cradles, frames, or ribs, in such manner and in such relation to each other as to enable the cradle bars to be adjusted to the bilge of the vessel desired to be hauled up, and to sustain the same by operating the lifting screws, on one side of the cradle frames.

96. Slide Valve Gear of Steam Engines; Elijah Ware, South Boston, Massachusetts.

Claim—The combination of the single eccentric having a short eccentric rod, the fulcrum plates carrying a fulcrum pin, having a connexion with the short eccentric rod, the slotted frame receiving the fulcrum pin, and a pin on the eccentric rod and the slotted plate receiving a pin, or its equivalent, attached to a rod connected with the valve.

97. Lock; Charles S. Westcott, City of New York.

Claim—The ungearing of two sets of wheels when a lock is unlocked, in such a manner as to allow the slotted wheels which receive the tongue of the bolt to remain stationary while the remaining wheels can be turned to any desired position, so that the combination can be changed through the key-hole from the front of the lock, said ungearing being effected by means of a bar, or its equivalent, acting upon a movable piece of metal which supports the shaft upon which one set of wheels revolve, said bar being moved by the action of throwing the bolt, so as to throw one set of wheels out of gear with the slotted wheels when the lock is unlocked, and bring them into gear again when it is locked.

98. Apparatus for Operating Valves of Steam Engines; Norman W. Wheeler, Brooklyn, New York.

Claim—Actuating the cut-off valves of steam engines by means of an eccentric, or its equivalent, when the motion of the main valve is derived from the same eccentric, or its equivalent, but modified by a movement derived directly from a reciprocating part.

99. Valve Gear of Steam Engines; John L. Whetstone, Cincinnati, Ohio.

I do not wish to be understood as limiting myself to the precise arrangement or combination of parts, as described, but will vary them as circumstances may require, while at the same time I accomplish the same ends by means substantially the same, as, for instance, a sliding plate valve or a piston valve may be used instead of the rotating valve herewith shown; and in that case, if preferred, a forked arm may be attached to the rod which operates the cut-off valve, and the adjustable radius bar may be operated in the forked opening so as to give the cut-off valve a similar varying intermittent motion as that described. Or the arrangement of the parts may be reversed, as, for instance, placing the forked lever or arm on the rod or rock shaft which operates the main valve of the engine, and communicating motion to the cut-off valve therefrom through an adjustable radius bar, similar to that described; and, if desired, the governor may be made to operate the cut-off and throttle adjustments by a direct attachment of rods and levers to the rotating disk, or an equivalent device, without the worm wheel arrangement.

Claim—1st, Operating the cut-off valve by means of a forked arm or lever which is actuated by means of an adjustable radius bar which derives its motion from the rock shaft or from the eccentric which operates the main valves of the engine. 2d, Adjusting the radius bar by the variations of the speed of the governor, by means of a rotating disk operated by a worm wheel, said worm wheel being in such relation to the governor that when the governor is running at its right speed, no motion is communicated to the same, but when the governor runs either too fast or too slow, the worm wheel is turned in one direction or the other, and the radius bar is raised or lowered so that the cut-off is effected sooner or later. 3d, Operating the throttle and cut-off valve adjustments in combination, in such manner that the throttle valve is moved slowly, and is not closed to any considerable extent, while at the same time the cut-off adjustment is moved rapidly, and on the other hand, when the cut-off adjustment is in position for the shortest period of admission of steam, the movements of the throttle valve are the most rapid, the whole being accomplished in the manner substantially as described.

100. Valves of Steam Engines; H. D. Wicks, Flint, Michigan.

I am aware that it is not new to have a valve constructed so as to serve as a steam chest. But I am not aware that the steam has been admitted to such valves in any other manner than from above the ports, which mode of admitting the steam subjects the valve, while operating, to a downward pressure, that causes it to bind on its seat, whereas, by admitting the steam from below the ports, the valve is subjected to an upward pressure, and thus is relieved from bind and wear while operating. I do not claim, broadly, so making a valve that it shall perform the office of a steam chest. But I

Claim—The valve having the ports and cavities, and suspended between screws, in combination with valve seat having the cavity or port, substantially as and for the purposes set forth.

101. Machine for Drilling Metals; Robert Wilson, Milton, Pennsylvania.

Claim—1st, The adjustable inclined plane, for the purpose of increasing and decreasing the feed of a hand or power-drilling machine for all kinds of metal. 2d, The peculiar construction of the self-acting feed escapement combined with the adjustable inclined plane, for the purpose of throwing off and on the feed to suit any depth of hole within its entire descent, and then return again only to the height required within its ascent. 3d, The adjustable bearing against which the lower end of the feed hand rests, in combination with the involute or scroll, and the feed hand which works upon it, for the purpose of producing a safety adjustable self-acting pressure escapement.

102. Fire Escape Ladder; John Withers, Collinsville, Illinois.

Claim—1st, The combination of the canvass bag or shoot with the ladder, A, in the manner described. 2d, The combination of a bed and its frame, arranged to open and close, as set forth. 3d, The arrangement of the two ladders, A and B, with each other, and also the means of adjusting the ladder, B, substantially in the manner described.

103. Breech-loading Cannon; Edward S. Wright and Theodore P. Gould, Buffalo, New York.

Claim—1st, A mortise made through the breech of a cannon, in combination with the sliding abutment. 2d, The expansive chamber, or its equivalent, in combination with the cannon and sliding abutment. 3d The application of a wrought iron band shrunk around the breech of a cannon, when the same is combined with a mortise and sliding abutment, as set forth.

104. Machine for Cutting Soap; Wm. B. Manning, Assignor to self and L. H. Olmsted, Oswego, N. Y.

Claim—The machine described for converting block and slab soap into bars and cakes, consisting substantially of the frame or series of cutters, the guiding and supporting bars, and the presser or follower.

105. Raking Attachment to Harvesters; Joseph Young, Marshallton, Pennsylvania.

Claim—The arrangement of the rake bar, shaft, and rod, provided with friction roller, jointed connecting rods, attached to crank pulley, inclined adjustable plate, spring, and nut, substantially as set forth.

106. LAMPS; Nathaniel Cradit, Ripley, Ohio, Assignor to Chester G. Robinson, South Reading, Mass.

Claim—1st, The described, or equivalent arrangement, of draft passages, communicating with the oil reservoir and central tube, conducting the air and gases from thence to the interior of the wick. 2d, The box and shell, in the described combination with two rectilinear sets of wick elevating pinions, or their equivalents, by which two flat wicks are converted into one circular wick.

107. HEELS FOR BOOTS AND SHOES; Samuel Flint and Robert S. Rodgers, Assignors to Wm. F. Johnson, Lynn, Massachusetts.

Claim—An improved manufacture of heel made of wood and india rubber, combined and arranged together substantially as set forth.

108. FILE-CUTTING MACHINE; George W., Assignor to self and D. S. Fogg, South D dham, Massachusetts.

Claim—1st, Controlling the opening of the regul ting valve of an atmospheric trip hammer employed in a file-cutting machine, for the purpose of regul ting the blow thereof, and producing a uniform depth of cut from end to end of the file, by means of a pattern whose form corresponds with, or has a proper relation to, the longitudinal profile of the file blank, applied and operating upon the said valve, substantially as described. 2d, In combination with the arrangement of the cutter guide block at a great r inclination from a vertical plane than the hammer stem, and with the fitting of the cutter or cutter stock loosely in said guide block—I claim the employment of a clamping piece, or its equivalent, applied to the sa d guide relatively to a proper bearing on the opposite side of the cutter, and operated substantially as described.

109. APPLYING GAS FOR HEATING AND ILLUMINATING PURPOSES; Calvin Pepper, Assignor to self and J. G. Treadwell, Albany, New York.

Claim—Passing coal or other inflammable gas, alone or in admixture with atmospheric air, through a stratum or mass of silicious sand without aggregation of particles to be inflamed at the surface, substantially as described, for heating purposes, and also for illuminating, as incident thereto, as d scribed.

110. PLOUGHS; Thomas Wiard, Assignor to G. W. and H. W. Pitken, and W. L. P. Wiard, Louisville, Ky.

Claim—The standard with its permanent wing and recesses or shoulders, for the reception of the removable wing, constructed and arranged substanti lly in the manner set forth. Also, in combination with the standard, constructed as set f rth, the adjustable cutting and guiding wheel, so that said wheel may be thrown into or out of action, as the circumstances of the case may requ re. Also, the uniting of the handles, beam, and standard together, by means of the pockets, dowels, recesses, and bolt, substantially in the manner described.

111. SLIDE VALVE GEAR FOR OSCILLATING ENGINES; Wm., Assignor to Richard Stephens, Old Forge, Penna.

Claim—1st, The combination of the two independently operating sliding bars and the levers, the former sliding bar b ing connected with the valves rock shaft, and furnished with fixed or adjustable stop pieces, and the latter being connected by an arm with the cylinder trunnion, and the whole operating to produce the motion of the valve or valves. 2d, Combining the stop-pieces with the sliding bar, by fitting them to slide in slots in the said bar, and attaching th m to a d uble slotted wedge applied to the said bar, for the purpose of adjusting or varying the lead of the valve or valves.

112. STEAM BOILERS; I. C. Stern, Assignor to George W. Stone, Philadelphia, Pennsylvania.

Claim—The application to locomotive boilers of the arrangement of tubes described, that is to say, the arrang ment of the coil, b, or its equivalent, on the insid and on one side of the fire-box, and the coil, b′, or its equivalent, on the opposite side, when one coil communicates with one pump, and the opposite coil with the other pump of the engine, and when the opposit coils are connected together by the pipe, d, so that the cold water direct from the pumps may pass into the coils, and thence in a heated state into the boiler, and so that the water may, at all times, circulate through both coils, as set forth.

113. LAMP SHADE SUPPORTERS; Wm. F. Shaw, Boston, Massachus tts.

Claim—The lamp shade supporter, with its upper and lower springs constructed of a single piece of metal, in the manner specified.

114. STRAW CUTTERS; Olive Ann Brooks, Somersworth, administratrix of the estate of Lebbeus Brooks, deceased, late of Great Falls, New Hampshire.

Claim—Two cutting knives or shears, or their equivalents, and so that, while one of them, when the machine is in op ration, shall have a compound motion, whereby its cutting edge shall be made to move in an elliptical path toward and away from the trough, the other shall have only a reciprocating motion in a circular arc toward and away from the said trough, the lever frame carrying the lower knife or bed, being made to turn on a fulcrum rod, or its equivalent, and to be connected with the upper knife by means or mechanism essentially as described. Also, the application to the upper knife having a compound motion of a toothed rake, to operate therewith and facilitate the feeding of the straw forward in manner as specified.

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115. MODE OF CLEANING RICE; Wilson Ager, Rohrsburg, Pennsylvania.

Claim—The forcing of a current of air into or through the grain during the cleaning operation, for the purpose set forth.

116. CAR SEATS AND COUCHES; Horace L. Arnold, Elk Horn, Wisconsin.

Claim—1st, Jointing the ends of the seats next the sides of the car to a stud or bolt, so as to enable them to be arranged to right angles to the sides of the car, or to be swung round or turned to a diagonal position, and to thus occupy the spaces between them longitudinally and increase the width of the passage way, and thus admit of their elongation to convert them into distinct sleeping berths or couches. 2d, The combination of the slotted bar, eccentric lever, clamp, and plates, with lips or raised edges for firmly fastening the seats in the required position to answer their designs. 3d, The combination of the slides, or their equivalents, and the T-shaped bars for sustaining the backs of the seats in an inverted position, and bolts or slides for securing the backs in their said inverted position.

117. SEEDING MACHINES; John Badger, Bailyville, Illinois.

Claim—The circular plates and stirrers attached to the rotating shaft within the seed box, arranged and combined with the slotted bottom and slide, substantially as set forth.

118. PEGGING JACKS; T. D. Bailey, Lowell, Massachusetts.

Claim—1st, The method of jacking the last by turning the plate to which the last is fastened. 2d, The

combination of the lever, screw, and turn-table. for jacking the last. 3d, Fastening the screw, or its equivalent, stationary, by means of the coupling pin and plate, so that when the turn-table is revolved, it shall operate the lever and jack the last. 4th, Fastening the screw, or its equivalent, to turn the plate, after the last has been jacked, by means of the coupling wheel and pin operated by the thumb latch and spring, for the purpose of preventing the screw from turning round and loosening the lever. 5th, The combination of two hinges, cam levers, hinge seat, the link, and hand set-screw, for the purpose described.

119. Harvesters; J. A. Barrington, Fredericktown, Ohio.

Claim—The combination of the bell crank and guide piece with the crane and rod. connecting the crank arm with the rakes and the crank shaft, giving motion to the system. Also, connecting the entire raking mechanism with the vibrating frame, substantially as set forth.

120. Stoves; B. W. Belson, Philadelphia, Pennsylvania.

Claim—The combination of the air chamber surrounding the base of the fire-pot with the annular chamber at the upper part of the fire-pot. Also, the jet-pipe, in combination with the annular chamber and escape pipe. Also, the adjustable heater, constructed as described.

121. Composition for Roofing; C. A. Bremner, Goshen, New York.

Claim—The composition consisting of marl and the other substances specified, combined and compounded in about the proportions and in the manner substantially as set forth.

[This is a compound of coal tar, rosin oil, india rubber, shellac, and linseed oil. with alum, litharge, borax, ochre, and dry marl, which, when mixed in the proportion specified in the patent, make an excellent and durable roofing cement.]

122. Pepper Cruet; H. T. Clawson, Newbern, North Carolina.

Claim—Placing within the perforated top or cap of a pepper cruet or box, a rotating or reciprocating partially rotating brush, arranged substantially as set forth.

123. Cut-off Gear for Steam Engines; John Broughton, City of New York.

Claim—1st, The combination of the two rock shafts, their arms, the vibrating links, the rods, and the lifters. the whole applied to operate upon a tappet or tappets on the valve stem, or its equivalent, for the purpose of lifting the valve, and subsequently tripping it by the continued and inherent motion of the lifters. 2d, In combination with the above specified lifting and tripping mechanism, the combination of the pendulous rods, the toggle links, and the slide, or their equivalents, connecting with a governor or other means of adjusting the same to vary the positions of the centres of motion, for the purpose of varying the point of cutting off the steam.

124. Harvesters; Chester Bullock, Jamestown, New York.

Claim—Attaching the vibrating cutter to the vibrating bar and fingers, as described.

125. Propeller for Life-boats; Mortimer M. Camp, New Haven, Connecticut.

Claim—The method of propelling inclosed life-boats by the application of the power of the occupants of the boat, as set forth.

126. Ellipsograph; E. G. Chormann, Philadelphia, Pennsylvania.

Claim—1st, Constructing the shoes in two parts, swiveled together as specified, in combination with the adjusting screw shaft. 2d, In combination with the screw adjustment of the movable shoe, the arrangement of the pencil or dry point carrier on a screw shaft, in order that the relative lengths of the axes may be readily varied to the smallest extent or a series of concentric ellipses be drawn varying very slightly in size. 3d, Arranging the drawing apparatus with a vibrating adjustable arm on a vertically adjustable arm, as described.

127. Breech-loading Revolving Fire Arm; E. Claude, City of New York.

Claim—Making the arm, between the barrel and exterior shaft, the bearing for the cylinder by a shaft on the forward end of the cylinder passing through and secured to the arm, when the said parts are combined with breech-piece and stock, so that the cylinder is rotated and stopped and the discharge effected, substantially as set forth.

128. Shingles; H. T. Clay, Gardiner, Maine.

Claim—1st, A shingle of uniform thickness at the butt so far as it is to be laid to the weather. 2d, A shingle that commences to taper at the point on the upper side, where the next layer above covers it, and tapers all on that side.

129. Preserve Cans; P. H. Cotton, Demopolis, Alabama.

Claim—In combination with the channel outside of the neck of the can, the employment of a recess in the neck and the extension of the rim of the cap over such recess.

130. Buckles; John Cumberland, Mobile, Alabama, and J. R. McClintock, City of New York.

Claim—The buckle or clasp composed of the parts, A and B, or their equivalents, substantially as described.

131. Bagasse Furnaces; Felix Daunoy, Carrollton, Louisiana.

Claim—The construction of bagasse furnaces, having the exit flue located in the interior of the furnace with the openings to admit the gas from combustion, when in combination with the wood or coal chamber, having a skeleton crown, and the grates on which the bagasse is consumed.

132. Slide and Fastening for Skirt Hoops; Alexander Douglas and S. S. Sherwood, City of New York.

Claim—The combined clamp and slide made entire of one piece by forming the clamp of the divisions and the slide of the lips, as described, the divisions being entire and connected at both ends to the plate, as shown, thus forming a continuous connexion around the end of the hoop.

133. Carpet Fastener; Richard DeCharms, Philadelphia, Pennsylvania.

Claim—An eyeleted carpet or floor cover binding, for the purposes set forth.

134. Hydrants; S. P. Francisco and Wm. P. Dickinson, Reading, Pennsylvania.

Claim—Providing said cylinder and piston with suitable openings for the admission of the air, and for the purposes set forth.

135. Balancing Mill-stones; John Fairclough, Louisville, Kentucky.

Claim—The arrangement of the cylinders within the boxes, the former being provided with tubes having

screw threads on their outer and inner surfaces, and provided with screws, and the cylinders provided with projections which fit in the grooves of the boxes, as set forth. Also, the plates and bottoms of the cylinders, when screwed on the tubes and used in connexion with the nuts.

136. Extension Finger Ring; Samuel Friend and George Seilor, City of New York.

Claim—The combination of the spring ring and folding bars, substantially as specified.

137. Machine for Separating Garlic from Grain; Philip C. Fritz, Barrytown, New York.

Claim—Separating garlic from grain by passing the same between crushing rollers, in the manner substantially as described, that the garlic seed and kernels of grain will be crushed separately between the rollers, and the crushed grain allowed to descend into a proper receptacle, while the garlic seed, on account of the moisture or juice they contain, adhere to the rollers, and are scraped therefrom.

138. Horse Power for Driving Reciprocating Saws; Edward M. Fuller, Salisbury, New York.

Claim—The connexion of the saw to the main body of a horse power which is operated by the circular movement of the animal, and extending the reciprocating rod, or its equivalent, from the main body of the machine across the track of the horse to the saw in such a position as to allow the horse to pass over it.

139. Cut-off Gear for Steam Engines; P. W. Gates, D. R. Fraser, and Thomas Chalmers, Chicago, Illinois.

Claim—The two sliding toe pieces, constructed as described, and applied within the rocking frame, to operate in combination with the double lifters attached to the valve stem, and with a stud and roller, or their equivalent, connected with a governor, or otherwise made movable.

140. Medicated Fabrics; Henry Glynn, Baltimore, Maryland.

Claim—Cloth or paper chemically prepared, for sanitary purposes, with a solution of which copper, or copper and calomine, are the bases, such manufactured article being designed for the prevention, or as a protection against, infectious or contagious diseases, and made as stated.

141. Paper Files; Edward R. Godfrey, City of New York.

Claim—The method of securing and transferring hooks to the back or steadying weight, by folding and uniting their ends down the entire length of the channel or groove in the lower surface of the back, so as to prevent them from twisting and dropping the file of papers, as would be the case if the ends of the wires were simply riveted into the back.

142. Seats and Sleeping Couches for Railroad Cars; Plymon B. Green, Chicago, Illinois.

Claim—1st, The arrangement under the seat, of a sliding drawer which has one portion of its top cushioned, and the other portion open, in combination with the hinged back, or cushion and stationary cushions. 2d, In combination with the above, the arrangement of the upper couches on hinges in the peculiar manner specified, so that they can be adjusted with facility.

143. Hanging Window Sash; Theodore F. Hall, Marietta, Ohio.

Claim—The employment and arrangement of pulleys or friction rollers at the lower corners of the sash, and the balancing of the sash on cords, in combination with pulleys and weights, or a weight, substantially as set forth.

144. Manufacture of Portable Fans; John C. Hall, Fayette, Mississippi.

Claim—The fan, when constructed in the manner described.

[This invention consists in having a series of short bars or rods jointed together, so that they may be folded into a compact cylindrical form, and distended to an annular shape. The bars or jointed rods form the frame of the fan, and a piece of silk, or other suitable material, can be attached to them to form a cover or body, which, when the frame is distended, is stretched sufficiently tight to form an efficient fan. The fan, when the frame is closed or folded, occupies very little space.]

145. Railroad Rails; Augustus Plinta, Albany, New York.

Claim—The construction of a railway rail by forming the same of a hollow of an elliptical or oviform shape in cross section, the lower portion of the arch being extended into a foot or flanch, and a segment of the upper arch being extended into a lip or face for the tread of car wheels, slots being made through the bottom and across the lower part of the body of the rail, substantially in manner and form set forth.

146. Manufacture of Scissors; Henry Havell, Newark, New Jersey.

Claim—The forming of the blades of scissors or shears by means of the use of the intermediate plate, or by soldering or brazing the malleable cast iron and steel together. Also, in the manufacturing of scissors or shears, the use of the die, as before mentioned, and the striking together and into the required line and shape, the component parts of the blades, substantially in the manner described.

147. Method of Gathering Grain upon, and Discharging it from, the Platform of Harvesters; Obed Hussey, Baltimore, Maryland.

Claim—The method described of gathering grain upon and raking it from the platform of a reaping machine, and depositing it upon the ground, by a raker riding on the machine directly behind the horses, and the gearing facing obliquely towards the grain which the machine is advancing to cut, and who, at a single operation with his rake, first, presses the grain in front of the machine backward against the cutter and over upon the platform; secondly, by a pivotal motion turns the prostrate grain upon the platform with its stalks parallel to the cutter; thirdly, slides the grain endwise off the platform at the side of the machine; and, fourthly, deposits the grain in a gavel on the ground behind his seat and across the track of the driving wheel of the machine.

148. Hoop Lock; Edwin A. Jeffery, Corning, New York.

Claim—A hoop lock composed of a shell or socket and a taper pin, made as described.

149. Bottle-stoppers; Thomas Lewis, Malden, Massachusetts.

Claim—A ball valve-stopper, as made with the separate cap provided with a discharging tubular mouth and crossed bars, or equivalents, for detaining the ball, as described, and connected with the main tube or body by a screw, or its equivalent.

150. Folding Bench; Tristram S. Lewis, Kendall's Mills, Maine.

Claim—The arrangement and combination of the hinge blocks, the leg slides, and the confining slide, as applied to the parts, A B, and their legs connected or hinged together so as to fold up.

151. Machines for Elevating Hay, &c.; James C. McGrew, Smithfield, Ohio.

Claim—The arrangement of the bar and inclined platform, with the shears and hoisting fork, substantially as described.

152. Buoyant Propeller; James Montgomery, City of New York.

Claim—1st. The described or substantially equivalent means of securing the flotation of a screw propeller by ejecting water therefrom by centrifugal action. 2d. The detachable hollow blades in the described combination with the shaft, for the purposes set forth. 3d. The application of the valve, arranged as described, in the forward end of the hollow shaft, for the purpose explained.

153. Seeding Machines; Albert W. Morse, Eaton, New York.

Claim—The arrangement of the hopper with the rollers, g g, belt or strap, E, rollers, m, and rings, as described.

154. Drafting Shirts; John Peckham, New Haven, Connecticut.

Claim—Drafting shirts by means of the neck and breast measures, formed and applied to the cloth, as shown and described, so that the neck circle will be chiefly cut or formed in the back portion of the shirt, and the upper part of the back portion folded over and united to the top of the front portion on a line with the base of the neck, as set forth.

155. Quoins for Gun Carriages; David D. Porter, U. S. Navy.

Claim—The combination and arrangement of the degree rack or racks, the axle thereof, the T-bolt and its groove, with the bed and wedge. I do not claim the mere use of raised projections for indicating numbers by the touch of the fingers, as I am aware that such is not new. But I claim the combination and arrangement of the tangible scale and axle with the degree rack and the wedge, so that by the application of the finger to both scale and axle at one and the same time, and during the night, or otherwise, the proper position of the wedge may be determined for any desirable elevation of the gun.

156. Self-adjustable Leveling Instrument; Joseph Redhead, Woodville, Mississippi.

Claim—Combining with the dish or case an inclined rod and ball or weights, so that when said case is set upon an inclined staff by its steel point, the ball will swing in the case into a level position, for the purpose of making a leveling instrument for ascertaining the ascent or descent of ground, as set forth.

157. Machine for Boring Wood; George F. Rice, Worcester, Massachusetts.

Claim—The hollow cross-bar, together with the double head bolt, which enables the operator to fasten the uprights at any angle by simply turning one nut.

158. Governor for Steam Engines; H. C. Sergeant, Columbus, Ohio.

Claim—1st. A steam engine governor composed in part of a steam engine which is subject to a uniform resistance, and which works independently of, and by its own velocity controls the velocity of, the engine to be governed, substantially as set forth. 2d. The employment of two disks having spiral projections on their faces, and provided with stop pins, applied to combine an engine which is to be regulated, with an isochronous revolving regulator. 3d. The combination of what is herein termed the "regulator engine," its regulator and regulating valve, or their equivalents, and the shafts, H and M, and their spiral-faced disks, one driven by said engine, and the other by the engine to be governed, the whole applied and operating in combination with a regulating valve, or its equivalent, substantially as described.

159. Brush; Reuben Shaler, Madison, Connecticut.

Claim—A brush, the bristles of which are secured by winding them into a spiral groove, and fastening them in the manner described, or by winding them into cement, as set forth.

160. Boiler Furnaces; Evan Skelly, Plaquemine, Louisiana.

Claim—The combination and arrangement of the gradually contracted fire chamber with the bridges, as described.

161. Harness Buckles; Orin B. Smith, Monticello, New York.

Claim—The combination of the lever, operating as described, with the bow, for the purpose of making a harness or other buckle, and to which may be attached straps, as set forth.

162. Hominy Mills; Ira Speight, Woodville, Mississippi.

Claim—Hanging mill-stones by means of right and left screws, substantially as set forth.

163. Buckles for Skirt Hoops; John Stevens and James Handley, City of New York.

Claim—The buckle, when constructed substantially in the manner described, in combination with the slides, having holes to receive the hook of the buckle.

164. Mitre Box; Asa F. Tarr, Rockport, Massachusetts.

Claim—A mitre box having a sliding frame attached to pivoted standards, and otherwise made, as described.

165. Cam Press; Enoch Thomas, Beverly, Virginia.

Claim—The mode of making and arranging the journal boxes so as easily to vary the space under the follower, and retain the uniform position of the pressure, in combination with the cam and windlass, cast solid, when constructed and operated substantially as specified.

166. Dynamometer; Wm. Tucker, Blackstone, Massachusetts.

Claim—The combination of the grooved slider and its screw connexion with the index pointer, or its equivalent, and the spring and pulley, or its equivalent, applied to a shaft, substantially as described, the slider having a feather connexion with the said shaft, as explained.

167. Ploughs; Reed Vincent, Rockton, Illinois.

Claim—The combination of the convex standard, the braces, and the mould-board, when arranged in connexion with the beam and bent handles, as described.

168. Labels for Trees, &c.; Francis T. Cordis and Wm. W. Wade, Long Meadow, Massachusetts.

Claim—The combination of a metallic ring or back with paper, or other suitable substance, on which is written or printed the name of a tree, shrub, plant, or seed, and a plate or plates of mica and a metallic ring, in either of the modes described, as a tag or label for designating and distinguishing the varieties of trees, shrubs, plants, and seeds in orchards, nurseries, and gardens.

169. Apparatus for Purifying Gas; Andrew Walker, Claremont, New Hampshire.

Claim—The combination and arrangement of separate chambers, opening into each other in such man-

ner that a current of water or fluid may be made to flow through the series in thin falls or sheets, or from one chamber to the next in a thin fall or sheet, and a current of gas be made to pass upward and through the several chambers, and successively through and against the several falls or sheets of fluid, the chambers being disposed one over the other in column, and the whole being to effect the purification of gas for illumination, as described.

170. STOVES; David Wells, Lowell, Massachusetts.

Claim—The arrangement of the flues, smoke chamber, air-heating chamber, and fire chamber, the latter communicating with the smoke chamber by means of the perforations, and the smoke chamber communicating with the air-heating chamber by perforations, substantially as set forth.

171. MANUFACTURE OF GLASS FURNACES AND POTS; Ezra Wells, Covington, Pennsylvania.

Claim—Pots and furnaces made of the black American clay, for use in manufacturing glass and glassware, substantially as set forth.

172. METHOD OF ATTACHING CUTTING LIPS TO AUGER SHANKS; Norman S. White and Aaron Denio, Shaftsbury, Vermont.

We do not claim, broadly, attaching the cutting parts to the screw shaft of augers. But we
Claim—The specific manner set forth and shown in the specification.

173. SMUT MACHINES; J. A. Woodward, Burlington, Iowa.

Claim—The arrangement of the wire cloth cylinder, scourer, deflecting or separating bar, spout, and shoe, as set forth.

174. INSTRUMENT FOR MEASURING ALTITUDES, &c.; George C. Ayling, Assignor to self and Henry A. Ayling, Boston, Massachusetts.

Claim—The arrangement of the index glass with respect to the detector glass, so as to enable the latter to be moved either into parallelism with, or at right angles to, the former, and combining with the detector glass and the main divided arc and index, a secondary index and divided arc, applied to register the movements of the detector glass, substantially as described.

175. WATCH FACES; Samuel Baldwin, Assignor to Baldwin & Co., Newark, New Jersey.

Claim—Arranging the figures of the dial without turning the works of the watch in a plane parallel to its face, so that they may be in the proper positions in relation to the pendant, whether the dial faces be the open or closed bizzle of the case.

176. CLOTHES FRAME; Wm. Hathaway, Assignor to Wm. G. Maynard, Worcester, Massachusetts.

Claim—Arranging the centre of motion of the cross-bars, so that the centre of motion of the outer end of the cross-bar, when the frame is closed, will be over or within the centre of motion of the inner end of the cross-bar.

177. HEMP BRAKES; Robert Heneage, Assignor to self and Edward O. Ball, Buffalo, New York.

Claim—1st, The combination of the reversing mechanism with the brake, beater, and shell, for the purpose of dressing hemp, as set forth. 2d, The combination and arrangement of the brake with the revolving beater, shell, and revolving apron, for the purpose of dressing flax. 3d, The arrangement of the chamber within the machine, for the purpose of affording room for the movements of the hemp while being dressed, substantially as described.

178. MACHINE FOR TURNING TAPERING TWISTS ON WOOD; Reuben K. Huntoon, Assignor to self and Jacob B. Rand, Concord, New Hampshire.

Claim—The arrangement of the several separate devices described, when operated as set forth, for turning irregular tapering forms of wood.

179. MANUFACTURE OF PAPER PULP FROM WOOD; Charles Marzoni, Assignor to J. Gandolfo, City of N. York.

Claim—1st, The use and application of the peculiar stone called "adamantine," described, when used as a means of tearing the woody fibre into a state suitable for pulp for paper, by rotation, or any other substantially similar manner. 2d, I do not claim steaming the wood, nor the use merely of hot water—but I claim the combining the use of the hot water at the boiling point, or 210° Fah., with the stone in rotation while acting upon the wood simultaneously and continuously, so that the hot water and flakes or particles of woody fibre immediately become united into pulp. 3d, The apparatus consisting of the cover or box, the boxed openings therein, and arms, rods, and weights, by which the blocks of wood are fed and held to the surface of the stone.

180. FAUCETS; Martin Robbins and James Powell, Assignors to James Powell, Cincinnati, Ohio.

Claim—The application to the key stem of the collar, cushion, and loose collar, or their equivalents, arranged in combination in the manner described, to compensate for the lateral wear or displacement of the stem.

181. ICE PICK; John L. Rowe, Assignor to Frederick Stevens, City of New York.

Claim—The spiral spring, in combination with the handle, rod, and point, arranged substantially as specified.

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182. BOOT JACK; Frederick Ahl, West Meriden, Connecticut.

Claim—The arrangement of the platform, vibrating arm, and cross-bar, as described.

183. LETTER ENVELOPE; James G. Arnold, Worcester, Massachusetts.

Claim—Making letter envelopes by cutting, folding, and pasting the paper, substantially in the manner described. Also, folding narrow folds at the ends or sides, so as to come inside between the face and back, in the manner described.

184. MANUFACTURE OF PYROGENIC OILS; Luther Atwood, Brooklyn, New York.

Claim—Forming oleaginous vapors from substances yielding pyrogenic oils, by the action of the heat of a properly regulated current of products of combustion passing over and above the surface of the mass, operated on with or without the aid of external heat, substantially as described.

185. APPARATUS FOR DESTRUCTIVE DISTILLATION; Luther Atwood, Brooklyn, New York.

Claim—The combination and arrangement of a "distilling tower" and receiving vessel with a steam blast,

or its equivalent, in the combination, for the purpose of producing an induced current, substantially in the manner described.

186. Apparatus for Destructive Distillation of Wood, &c ; Luther Atwood, Brooklyn, New York.

Claim—1st, The use of the inner case in the manner set forth. 2d, The described arrangement of the flues leading from the annular passage into the distilling tower. 3d, The combination with the distilling tower of the combustion chamber or fire-place, when so arranged as to supply products of combustion by a downward draft through the fire-place, substantially as described.

187. Lamps; William W. Batchelder, City of New York.

Claim—The small tapers or wick tubes, D, placed on both sides of the flat burner or wick tube, C, in combination with the cap, when the said tubes and cap are used without a chimney, substantially as set forth.

188. Manufacture of Artificial Fuel; Wm. A. Bradley and Jacob Bigelow, Washington City, D. C.

Claim—The manufacture of artificial fuel made from refuse bituminous coal, anthracite or charcoal, combined with the substances herein described.

189. Grain Measure; Job Brown, Lawn Ridge, Illinois.

Claim—A grain tally having a slide operated by a pendent and spring, a lever, pawl, ratchet wheel, and indicating belt, the whole combined as described.

190. Revolving Fire Arms; John W. Cochran, City of New York.

Claim—1st, The hinged or jointed thumb-piece of the hammer or cock, constructed as set forth. 2d, The worm-wheels upon the cylinder shaft, and the tumbler shaft or hammer shaft, combined as described. 3d, The means, substantially as set forth, for allowing the cylinder to be rotated within its frame independent of the shaft of the hammer or tumbler, and also allowing of the detaching of the cylinder and its shaft from the frame and from the means of rotation.

191. Compensating Pendulum for Clocks; Wright S. Coffinberry, Grand Rapids, Michigan.

Claim—The combination of two metals of different expansibility, in the manner and for the purpose set forth.

192. Stump Extractors; Francis M. Eagle, North Manchester, Indiana.

Claim—Overcoming the resistance by the movement of a roller invariably connected with the stump upon a track either rectilinear or curved, all parts of which, except the starting point of the roller, are exterior to the circle, with the invariable connexion for a radius, and the point of attachment of the hook for a centre, the operation being substantially as described.

193. Stoves; Nelson Edwards, Chittenden Co., Vermont.

Claim—The application to a stove of an improved combined hydro-atmospheric jet and gas chamber. Also, the stove-contained coiled smoke-pipe, in its combination with the plurality of stove walls, substantially as described.

194. Spring Bottom for Chairs and other Seats; Patrick Gallagher, Pleasant Unity, Pennsylvania.

Claim—Making the bottoms of chairs, or other seats, of spring plate metal, so that, when laid loosely upon the frame, said plates shall be both a bottom and a spring, substantially as set forth.

195. Printing Press; S. R. Cotton, Green Bay, Wisconsin.

Claim—Operating the form bed from the pressure cylinder, B, by means of the cam or eccentric, M, provided with the pin, O, rack bar, D, provided with the projection, p, and roller, n, the pinions, E G, on the shaft, F, with or without the pinion, H, slide bar, L, and spring, S, and the rack bar, I, as set forth. Also, the toothed sector which gears into the pinion of roller, a′, and is connected with the rack bar, D, by means of the slotted arm on the rack bar, and the arm of the sector provided with the pin, O, the rod, c′, attached to the arm, d′, the pawl, i′, attached to the arm, d, and the ratchet, h′, attached to the roller, g′, the whole being arranged so that the inking device will be operated automatically from the pressure roller. Further, having the bearings, b b, of the pressure cylinder, attached to rods, d d, which are connected by tension nuts to straps that encompass the eccentrics, g, of the shaft, h, for the purpose of readily raising, when necessary, the cylinder, B, and regulating its pressure.

196. Steering Propeller; H. E. Teseel, Chicago, Illinois.

Claim—The arrangement and combination of the slotted frame, propeller, driving shaft, and chair wheel, substantially as described.

197. Seeding Machines; Joseph Fowler and F. M. Bacon, Ripon, Wisconsin.

Claim—The reciprocating perforated slide, stationary perforated slide, and perforated roller, in connexion with the inclined board, arranged to operate as set forth.

198. Shuttle Boxes for Looms; A. F. Gibboney, Union Township, Mifflin Co., Pennsylvania.

Claim—The half swell on the inner end of the fly to be operated on by the picker, as set forth.

199. Sash Fastener; Porter A. Gladwin, Pawtucket, Massachusetts.

Claim—The employment of the perforated plate with the notch spring, as described.

200. Propeller for Boats; James Hamilton, City of New York.

Claim—The arrangement of two sets of propeller buckets in a reciprocating frame, so that they act in opposite directions to give head or stern way respectively, when said buckets are combined with sliding stops, fitted and acting to retain one set of buckets in a folded and inoperative position, while the other set is acting to move the vessel, as set forth.

201. Typographer; Henry Harger, Delhi, Iowa.

Claim—1st, The employment or use of the bed-piece, frames, D and C, and type frame formed of the plates, E E, arranged substantially as set forth. 2d, The particular means employed for feeding the frame, C, and paper or wax to the type, to wit: the bent lever connected to the hand lever, the ratchet, and cords or chains attached to the frame, C. 3d, Regulating the feed movement of the frame, C, by having the types made of varying heights or lengths, so as to give corresponding lengths of vibration to the lever, substantially as described.

202. Furnaces for Burning Lime; Thomas R. Hartell, Philadelphia, Pennsylvania.

Claim—As an improvement in reverberatory furnaces for burning lime, providing a recess in the side walls in which a corresponding projecting edge of the fire-proof traveling platform fits, in the manner de-

scribed, for the purpose of cutting off all communication between the heated upper chamber and the cool lower chamber, at the same time presenting no obstruction to the forward movement of the truck and platform.

203. LOCK; Spencer Hiatt, Indianapolis, Indiana.

Claim—1st, The combination and arrangement of the tumblers and key bits with the lever, sliding yoke, and lever arms, when constructed as set forth. 2d, The combination of the comb spring and slide with the tumblers, when constructed as set forth.

204. BREECH-LOADING CANNON; John W. Hollensbury, Alexandria, Virginia.

Claim—1st, A breech-loading cannon formed in two parts and secured together by means of a frame. 2d, In combination with the two divisions of the cannon the frame fitting closely up against the breech and capable of being elevated or depressed, as set forth. 3d, In combination with the two divisions of the gun, the band or circular wedge, constructed as described.

205. LADIES' HOOPED SKIRTS; John Holmes, Boston, Massachusetts.

Claim—The net-work fabric described, having the number or size of its meshes reduced toward the top in such a manner as to throw the fullness in one direction or on one side, so that when the hoops are inserted it is self-sustaining, to produce the "bishop" or "bustle" form, and preserve that form to the bottom of the skirt, as set forth, without the use of lacings, springs, extra "bustles," or other contrivances.

206. METHOD OF ADJUSTING THE TRIPPER TO THE ESCAPEMENT LEVER OF TIME-KEEPERS; Edwin B. Horn, Boston, Massachusetts.

Claim—The movable plate, or its equivalent, supported so as to be capable of turning on a pivot, or its equivalent, carried by the stand, the same being for the adjustment of the beat or the pin or tripper of the escapement lever, as specified.

207. INKSTAND; Thomas S. Hudson, East Cambridge, Massachusetts.

Claim—The arrangement of a vent hole within the flexible or elastic diaphragm, and with respect to the ink receiver, essentially in manner as described.

208. TOOL FOR SLOTTING CLOTHES PINS; John Humphrey, Keene, New Hampshire.

Claim—Arranging knives or cutters to widen or flare the outer ends of the slots in clothes pins simultaneously with the sawing thereof, by having portions of the plate of the saw removed, and the cutters secured to the disks or flanches on the arbor, and held thereby independent of the saw, by which arrangement a perfect and complete slot may be cut at a single operation, and the cutters may be quickly and accurately adjusted to any required position, and be securely kept therein or be readily removed when desired.

209. PROPELLING AND STEERING APPARATUS; Samuel Huse and Samuel Huse, Jr., Chicago, Illinois.

Claim—As an improvement in propellers when hung within the rudder and operated by gears, receiving the end thrust of the propeller shaft upon the sleeve on the post, arranged as described.

210. SPRING TACKLE BLOCK; Obed Hussey, Baltimore, Maryland.

I do not confine myself to any special form or arrangement of the strap and the block, or of either (as these may be indefinitely varied), so long as the block is constructed with a seat to yield to the force of sudden shocks, and thereby prevent the dangerous jerks, which, as described, it is the object of my invention to prevent. But I

Claim—A block having a yielding seat, substantially as set forth.

211. PRESERVING FRUITS; John R. Jenkins, Kingston, Pennsylvania.

Claim—Dusting the articles to be coated with any dry powder, such as plaster of Paris, or its equivalent, to prevent the coating from adhering to the articles coated, and permitting it to come off readily.

212. GAS RETORTS; Wm. H. Laubach, Philadelphia, Pennsylvania.

I do not desire to confine myself to the particular form of the retort illustrated, or to the exact shape of the plate, D, inasmuch as both may be considerably modified in shape without any deterioration of the result.

Claim—Dividing the retort into an upper and a lower chamber by means of a movable plate, D, said plate being so constructed and so arranged in respect to flanches or projections in the retort, and being so weighted that the amount of vapor admitted into the communication between the two chambers shall be proportionate to the rapidity with which it is generated, and that the vapor shall pass from the lower chamber in a stream so attenuated and so exposed to red-hot surfaces, as to insure its being converted into permanent gas on entering the upper chamber, as set forth.

213. CLOTHES HORSE; Tristram S. Lewis, Kendalls' Mills, Maine.

The arrangement of the four spring catches is such that the spring, while operating to press the horse open, and to maintain it in an extended state when unfolded, will also operate to maintain all the catches in engagement with their respective slats. Therefore, when the posts are hinged together, and the four folding sets of slats are applied to them, and arranged on them as described, I

Claim—The arrangement of the spring and the two sets of spring catches, in order that the said spring may perform at one and the same time the two functions, as specified.

214. FRUIT CANS; W. W. Lyman, West Meriden, Connecticut.

Claim—In combination with the groove for receiving and holding the packing and the flanch on the cover, fitting into said groove and against the packing, the sleeve with its cam slots, and the studs on the neck of the can, for drawing the flanch of the cover tight down on to the packing without crimping it.

215. CULTIVATORS; Howard Mann, East Attleborough, Massachusetts.

Claim—1st, The application of each wheel arbor to its wheel and the frame, so that the wheel may turn on the arbor and the latter extend into slots, and have fastenings, whereby not only the wheel may be adjustable with reference to the cutters, but the arbor and its screws and nuts may be employed to strengthen the frame. 2d, The described arrangement of each of the slots of the wheel arbor, with respect to the scraper of the periphery of the wheel, whereby the wheel at whatever altitude it may be placed while its arbor is in the slots, will be at one uniform or proper scraping distance from the scraper. 3d, The application or arrangement of the slide bar of the cutter, so as to operate not only as a scraper to the wheel, but as a supporter of the cutter post or rod.

216. SEED PLANTERS; F. M. Marshall, Seguin, Texas.

Claim—The arrangement of perforated plates, beam, gauge wheel, bull tongue plough, roller, crank, arm, and handles, the whole being constructed as set forth.

217. Machines for Picking Corn; S. W. May, Gatesburg, Illinois.

Claim—The bars, the elevators, the fingered belt, the frame, the crank with its pitman, or their mechanical equivalents, the whole being combined as set forth.

218. Locomotive Axle Bearings; David Matthew, Philadelphia, Pennsylvania.

Claim—The peculiar construction of journal-box or bearing in one piece, having a longitudinal slot or opening, operating substantially as set forth.

219. Door Spring; T. J. Mayall, Roxbury, Massachusetts.

Claim—The described india rubber torsion door spring.

220. Shirt Stud; Charles McIntire, Newark, New Jersey.

Claim—The latch and catch, constructed substantially in the manner set forth.

221. Corsets; Anne S. McLean, Williamsburg, New York.

Claim—Providing the upper sections or pads of the corset with cone-shaped flat steel, or their equivalent springs and spring supporting plate next the body, for the purpose of giving elasticity to the pads, which pads are held in their places by the weight of the corset.

222. Iron Pavements; Richard Montgomery, City of New York.

Claim—A metallic pavement, consisting of a series of parallel arched corrugations, reaching or extending from the curbstone on one side of the street to the curbstone on the other side. Also, casting or making the upper parts of the corrugations thicker than the lower parts, in the manner set forth. Also, supporting or anchoring the pavement when it is cast in sections by a grooved central support, as shown. Also, the dovetailed recesses and projections, in combination with the projections, for the purpose of holding the pavement in place.

223. Device for Transmitting Rotary Motion; Henry Morris, West Philadelphia, Pennsylvania.

Claim—The combination of the convolute gear and convolute groove with a sliding pinion or gear, substantially as described.

[This invention consists in the combination of two beveled gears, one of which has its teeth arranged in convolute form, and the other of which, gearing with the first one, has its teeth concentric to its axis; the latter being fitted to slide on its shaft that it may, when geared with and driving or being driven by the first one, approach or recede from the axis of the same under the guidance of a convolute groove, which is formed between the convolute coils of teeth, and be thereby caused to receive from or impart to the first one a gradually increasing or diminishing velocity. The device may be applied to many purposes in machinery, but is more particularly intended to be applied to the spinning mule, the first gear being secured to what is known as the "scroll shaft" of the mule to drive the other one, which is attached to a shaft which drives the rollers, for the purpose of producing a gradual diminution of speed of the rollers before stopping them after the mule carrier has moved out a certain distance from the rollers, and thereby prevent the jerk on the yarn, which is caused by stopping the rollers suddenly.]

224. Blind Fastener; John Murphy, Boston, Massachusetts.

Claim—The arrangement of the spring catch on the pintle step shank, and with respect to the notched pintle. Also, combining with the catch and its case a movable projection or cover, applied so as to be capable of being moved on and off the pintle head, and to carry the thumb projection or stud of the catch, substantially in manner specified.

225. Lathe for Turning Masts, &c.; P. H. Niles, Boston, Massachusetts.

Claim—1st, The revolving traversing cutters, in combination with the dogs, or their equivalents, for supporting the stick of timber, operating in the manner described. 2d, Raising the dogs automatically as the cutters approach them. 3d, The method of controlling the position of the cutters by means of the combination of the slotted wheels, the gears, and the pattern, and their connexions, substantially as set forth.

226. Construction of Iron Railing; James Nuttall, New Orleans, Louisiana.

Claim—The combination of bent sheet metal rails, with grooves in the panels, receiving the edges of the rail, and giving an internal and external bearing to the rail, substantially as set forth.

227. Lathe Machine; Jacob Pefley, Bainbridge, Indiana.

Claim—The combination of the reciprocating knife, the bolt supports or bars, and the stationary bar or bed, arranged substantially as set forth. Also, the shaft provided with the bent rods, and connected or arranged with the rock shaft of the bars through the medium of the levers, bars, and the arm, substantially as set forth. Also, in connexion with the knife, bars, and bed, the registering device operated from the rock shaft through the medium of the pawl connected with the lever, rod, and bent lever, so as to be thrown in contact with the ratchet by the bolt, as set forth.

228. Cores for Moulding Plastic Substances; James Pilgrim, New Britain, Connecticut.

Claim—Constructing cores for moulding in plastic clay, cement, or other like substances, of india rubber, or equivalent material, so that they be inflated and collapsed, substantially as described.

229. Pestles for Cleaning Clothes; Ezra Pollard, Albany, New York, Assignor to self and B. W. Seeley, City of New York.

Claim—A clothes pounder or pestle composed of a stock, handle, tubes, and openings, as described.

230. Burnishing Attachment for Lathes; James S. Ray, East Haddam, Connecticut.

Claim—The arrangement and combination of the plate, E, plate, F, spring, mandrel, and tool, as described.

231. Steering Apparatus; Jesse Reed, Marshfield, Massachusetts.

Claim—1st, The duplex screw shaft, in combination with the nuts and guide rods, the rods being each permanently connected with one of the nuts, and passed through the lug on the other nut, operating in the manner specified. 2d, In combination with the above, connecting the nut to the rudder head by means of the arm, bulb, and rod, operating substantially as described.

232. Trace Fastenings; Neil J. Reynolds, Webster, New York.

Claim—1st, The formation of the eye which receives the tongue, for the purpose described. 2d, The tongue, in combination with the tube, spiral spring, and bolt, which fastens the tongue in the eye.

233. Rrailroad Car Brakes; J. W. Rice, Springfield, Massachusetts.

Claim—1st, The suspension bar, crotch bolt, and nut, when arranged and operating in the manner de-

scribed. 2d, The continuous rod and loose pulley, in combination with the suspension bar and crotchet bolt and nut, when arranged and operating substantially as set forth. 3d, The loose collars on the standard, when applied in the manner set forth.

234. Bedstead Fastening; Oliver Robinson, Rochester, New York.

Claim—The combination and arrangement of the hooked locking bolt with the circular wrench and eccentric, for holding the bolt by means of the lip in the proper position for entering the post and tightening the connexion made with the pin, or its equivalent, substantially as set forth.

235. Apparatus for Walking on the Water; Henry R. Rowlands, Boston, Massachusetts.

Claim—The construction and use of the apparatus by the arrangement of the metal floats, the metal ballast boards, and the wooden stanchions, in a manner substantially as described.

236. Dredging Machine; James Stewart, New London, Connecticut.

Claim—The arrangement of three series of dredging buckets in the same dredging machine. for the purpose of excavating a channel in the earth throughout the entire width of the boat. Also, arranging the windlass barrels which raise the dredging apparatus out of the water, on the same shaft that operated the dredging chains, so that they may be locked to the shaft to raise the dredging apparatus without stopping the chains of dredging buckets, substantially as described.

237. Burring Machine; O. W. Stow, Southington, Connecticut.

Claim—The arrangement and combination of the spring, gauge, and rollers, substantially as described.

238. Manufacture of Starch; S. T. Stratton, Philadelphia, Pennsylvania.

Claim—Steeping the material from which the starch is extracted, either whole or crushed, in an alkaline or caustic alkaline liquor of a suitable strength and artificially heaten to a temperature of from 70° to 130° Fah., as specified.

239. Washing Machine; G. W. Swigert, Monmouth, Illinois.

Claim—A cylinder of brushes, a concave supported on spring, guard, attached to rod, pounders, tappet drum, and otherwise constructed as described.

240. Closet for Sewing Machines; Wm. P. Uhlinger, Philadelphia, Pennsylvania.

I do not desire to confine myself to the described construction or combination of the various parts in every minutia. But I

Claim—Combining the sewing machine platform with the lid of the closet, that the opening and shutting of said lid shall operate the platform, substantially in the manner set forth.

241. Railroad Car Seats and Couches; Nathan Thompson, Jr., Brooklyn, New York.

Claim—1st, The combination of longitudinal seats, with a raised platform and berths or reclining places beneath the seats and platform. 2d, In combination with berths or reclining places beneath a seat, and a raised platform serving as a foot-stool to such seat, I claim a back to that seat capable of being moved, or of change of place, so that it may serve, at will, as a back or as a couch above the main seat. 3d, Making the top of the platform or foot-place pertaining to the main tier of seats movable, substantially in the manner specified. 4th, Arranging within a railroad car, longitudinal couches along or upon the floor, and other couches or seats above these, with backs, which may be converted into couches and passage ways, or a passage way, from which free access may be had to all the seats and couches. 5th, Combining with longitudinal passage ways or a longitudinal passage way, longitudinal seats, when those seats have backs so constructed that they may be converted into couches, or when those seats are free to slide transversely, substantially in the manner described. 6th, Adjustable or movable end seats, substantially such as described, and serving, if necessary, as steps, in combination with longitudinal car seats, having backs capable of conversion into couches.

242. Apparatus for Generating Illuminating Gas; Charles A. Tyler, Washington City, D. C.

Claim—1st, The peculiar arrangement and combination of the retort for generating the hydrogen gas with the main retort for the generation of the illuminating gas. 2d, Elongating and contracting the rear end of the main retort, in the manner set forth. 3d, Connecting the rear end of the hydrogen retort with the contracted end of the main retort, in the manner set forth.

243. Burners for Vapor Lamps; Sigourney Wales, Boston, Massachusetts.

Claim—When the wick is supported on and around an inner wick tube and within an outer wick tube, and the jet-cap is made separate from and so as to screw or fit on the outer wick tube, as described, the application of a rod to the movable jet-cap and the inner wick tube, in such manner as to be fastened to the cap and extend into and fit the bore of the tube, so as not only to enable the jet-cap to be raised and supported above the wick in manner to allow such wick to be inflamed, and the flame thereof to heat the said jet-cap and rod, but to serve as a means of conducting heat from the jet-cap into the inner tube, by which such heat may be conducted into the wick in order to aid in vaporizing the liquid contents thereof.

244. Making Edge Tools; Wm. White, Newark, New Jersey.

Claim—The use of wrought iron and steel separately or combined, while in a melted or liquid state, for the purpose of forming into shape axes and other articles, without the process of forging, welding, or swaging, by the use of a mould, the cavity of which is the shape or form of the articles desired, as set forth.

245. Life-preserving Trunk; Oliver Evans Woods, Philadelphia, Pennsylvania.

Claim—A valise or trunk, made substantially as shown and described.

246. The Cutting Apparatus of Harvesters; Wm. A. Wood, Hoosick Falls, New York.

Claim—The manner described of constructing the guards and uniting them to the finger-bar.

247. Door Fastener; Gilbert Yates, West Dresden, New York.

Claim—A door fastener constructed of the pieces, A A′ A″, bolt, keeper, and slot, operating as set forth.

248. Turnbuckle for Window Blinds; Joseph L., Assignor to self and George Chapman, Philadelphia, Pa.

Claim—The turnbuckle and sliding collar provided with the flanch and the spring, placed on the spindle or arbor, as set forth. Also, in combination with the above named parts, the washer placed on the arbor.

249. Railroad Car Seats; George L. Dulaney, Assignor to self and Solomon R. Moore, Mount Jackson, Va.

Claim—The combination and arrangement of the movable seat bottoms, hinged folding cushions, sliding slat blind frames, and hinged cushioned frames, and cushioned flaps on the backs of the seats and slides or panels.

250. EXPANDING BIT; Harley Stone, Assignor to Paul P. Todd, Blackstone, Massachusetts.

Claim—The mode and application of the slide cutter, the slits, the bolt, and the graduated scale, constructed as described.

251. METHOD OF BLASTNG OR REMOVING SUBMARINE BODIES; Samuel Eakins, Assignor to self and M. S. Wickersham, Philadelphia, Pennsylvania.

Claim—The combination with a piece of ordnance to be employod under water for the removal of rocks or other bodies, by the operation described, of a series of adjustable legs, applied and operating substantially as and for the purpose specified.

[In this method of blasting or removing submarine bodies, a very heavy cannon, loaded with powder and ball, is sunk with its muzzle in contact with, or as close as possible to the face of the rock or other body to be removed, and fired by a galvanic battery, to project the ball against the rock. The weight of the column of water above the cannon, added to the weight of the cannon itself, prevents recoil, and causes the ball to be projected with immense force. The cannon has adjustable legs, which support it or attach it to the body to be removed, and enable it to be set at such angle as might be desirable to split off a ledge of rock. When the cannon has been fired, it is raised by chain tackles attached to it. Experiments show this to be a very effective method of blasting.]

252. STACKING AGRICULTURAL PRODUCTS; Carlos W. Glover, Farm Ridge, Assignor to self, Bronson Murray, and J. Van Doren, La Salle Co., Illinois.

Claim—Making a stack out of two, three, four, or more lengths of straw, or other material, that overlap or break joint with each other, and which are laid with their seed ends pointing to a common centre, and commencing at the apex and ending at the base, and drawn together and secured substantially as represented, using as a foundation to build upon an apron or the binding cords or chains, as set forth.

253. STACKING AGRICULTURAL PRODUCTS; John Van Doren, Farm Ridge, Assignor to self, Bronson Murray, and Carlos W. Glover, La Salle Co., Illinois.

Claim—The so placing of two, three, or more layers of stalks or straws in a box or former, that they shall break joint with each other, beginning at the apex and so continuing until one-half of the stack is formed, and then reversing the operation and laying them from the base to the apex for the other half of the stack, so that, when bound up, they shall form a stack shingled on its outside to protect the interior, substantially as described.

254. CAST IRON MERCURY BOTTLE; Moses Wrangle, Assignor to Hunter, Keller & Co., City of New York.

Claim—Moulding iron mercury bottles with concave bottoms by means of the patterns, substantially as described.

ADDITIONAL IMPROVEMENTS.

1. ROTARY PUMPS; Levi Burnell, Milwaukie, Wisconsin; patented August 31, 1858; additional dated December 14, 1858.

Claim—Operating three or more pairs of sliding valves in said pump, by means of the joint action of the rotary valves box, and the three-sided stationary cam, substantially as set forth.

2. MANUFACTURE OF SOAP; Dalrymple Crawford, Toronto, Canada; patented March 13, 1858; additional dated December 14, 1858.

Claim—Using the refuse of Indian corn, and mixing it with a fat or oil and an alkali, and with or without resin, amalgamating the same to make soap. Also, subjecting the refuse of Indian corn to an alkali, with or without heat, and modifying the strength of the alkali when too strong and not required by an acid, and for the purpose of mixing it more easily with the soap.

3. MACHINERY FOR DRESSING AND SIZING WARPS; Wm. Bradley, Manchester, Virginia; patented May 11, 1858; additional dated December 21, 1858.

Claim—The covering of the drying rollers with some non-conductor of heat, or material having less conductive properties than the material, to prevent the caking or uneven drying of the size in the warps.

4. CAR SEATS AND COUCHES; A. M. Holmes, Assignor to self and A. G. Purdy, Morrisville, New York; patented December 6, 1858; additional dated December 21, 1858.

Claim—The use of the adjustable back-pad, or equivalent, and combined therewith the adjustable head rests.

RE-ISSUES.

1. METALLIC TIPS FOR BOOTS AND SHOES; George A. Mitchell, Turner, Maine; patented January 5, 1858; re-issued December 7, 1858.

Claim—My described metallic tips, constructed in the manner set forth. Also, a metallic tipped boot or shoe, constructed essentially in the manner set forth.

2. PISTOLS AND OTHER FIRE ARMS; Ethan Allen, Worcester, Mass., formerly of Norwich Connecticut; patented April 16, 1845; re-issued December 14, 1858.

Claim—Extending the rear end of the dog or catch rearward and beyond where it is jointed to the tumbler of the percussion hammer, and connecting the upper end of the main spring directly to the part so extended, or otherwise connecting the main spring to the dog so as to cause it to operate upon the hammer, dog and trigger. Also, the arrangement of a mechanism in connexion with a self-cocking arrangement, whereby I am enabled to make the fire arm so as to be cocked at pleasure by the hammer, or to be operated entirely by the trigger, self-cocker, and mechanism consisting of the stud and the dog or catch, in connexion with the tumbler, or their equivalents, whereby the same results are obtained. Also, the piece of metal, as combined with or applied to the sere of the trigger, and in front of the notch thereof and hook of the catch, and operating in relation thereto, in the manner and for the purpose as explained. Also, my peculiar arrangement of the pitman upon the sere of the trigger, so as to operate, as above described, in combination with the construction and arrangement of the teeth upon the breech or rear end of the cylinder or series of barrels, by which improvement in constructing and arranging the aforesaid parts I am enabled to very much simplify them, in comparison with the manner in which they have been made and disposed.

3. CORN PLANTERS; Nathaniel Drake, Newton, New Jersey; patented February 2, 1858; re-issued December 14, 1858.

Claim—1st, Operating the seed valves from the traction wheels by means of the rods or weights and cams, arranged as set forth. 2d, The agitator, arranged with relation to the seed boxes and valves, as set forth. 3d, The rib attached to the upper valve, constructed and operating as shown. 4th, Combining with one of the

weights which operate the valves, or its equivalent. a cam-shaped gear wheel corresponding in form with the cams which operate said weights. 5th. Extending the chains which operate the valves down under the pulleys back of the axle, so as to obviate the slackening and taking up of the chains by the vibrations of the ploughs and their attachment.

4. Organs; William Sumner, Worcester, Massachusetts; patented February 28, 1854; re-issued December 14, 1858.

Claim—The combination or arrangement and connexion with the keys, of a mechanism which shall enable the extreme key touched on either side, or both when operating itself, shall prevent all the others from operating in the stop or stops, connected therewith in the manner set forth. Also, controlling and operating the escape valve by means of friction on the arm, or its equivalent, in the manner set forth.

5. The Manufacture of Elastic Cloth; Horace H. Day, Assignee of Richard Solis, City of New York; patented November 7, 1849; re-issued December 14, 1858.

Claim—The new elastic cloth described, consisting of a woven textile material (or cloth), having the threads of the warp oblique to the weft, combined with gum elastic or india rubber, so that the two constitute an elastic compound fabric.

6. Reaping Machines; C. W. McCormick, Chicago, Illinois; patented October 23, 1847; re-issued May 24, 1853; re-re-issued December 21, 1858.

Claim—The combination of the support or stand for the raker, placed behind the axis of the reel, balanced or sustained with the raker thereon by the driving wheel, with the reel and with the short platform. Also, combining with the side draft reel reaping machine, having a reel for gathering the grain to the platform, a stand or seat for the raker fixed firmly upon the platform of the machine, so as to enable the raker securely to get at the grain as deposited on the platform by the reel, and deliver and lay it properly on the ground, from a single or short platform, out of the return track of the horses, in suitable gavels for being bound into sheaves. Also, the combination of the reel for gathering the grain to the cutting apparatus, and depositing it on the platform, with the stand or support for the raker, or the equivalent thereof, to enable him with ease and celerity regularly to remove the grain from the machine, and lay it on the ground out of the return track of the horses. Also, the construction of the stand or support for the raker, on the frame or platform of the machine, so that it gives to the raker such lateral and forward support to his body when standing at work that he may have free use of his arms and the upper part of his body to remove the cut grain from the platform, while at the same time he is so held fast that he cannot be thrown upon the reel, nor prevented from performing his functions by the jolting of the machine as it moves over the uneven ground.

7. Shears; Joseph A. Braden, La Grange, Georgia; patented September 21, 1858; re-issued Dec. 28, 1858.

Claim—The construction of scissors or shears with their blades in separate pieces from the handles, and fitted to the handles with stems and sockets.

8. Looms for Weaving Figured Fabrics; George Crompton, Worcester, Mass.; patented Nov. 11, 1854; re-issued December 28, 1858.

Claim—Combining with hook jacks which are connected with the harness, and with the mechanism for operating them to open the shed, a pattern chain or cylinder constructed with two or more patterns, and operated so that either of the patterns can be made to act on the hook jacks to place them in the required position to be operated upon by the mechanism for operating the shed. Also, in combination with a pattern chain, arranged with two or more patterns in the direction of its length, the mechanism for changing the movements of the chain to effect the changing of the pattern. Also, placing two or more patterns upon the rods of a pattern chain side by side, and operating them in succession by vibrating the chain laterally. Also, pivoting the lifting and depressing rods at one end, the other being made adjustable. Also, moving the rods or jacks out of contact with the rollers on the pattern chain, before the chain is moved by means of what are termed the vibrating fingers, or the equivalents thereof.

9. Steam Stove; J. L. Sutton, Norristown, Pennsylvania; patented July 20, 1858; re-issued Dec. 28, 1858.

Claim—Combining two or more concentric chambers, connected together and arranged in respect to each other, with a boiler attached to an ordinary stove, for the purpose specified.

10. Machinery for Cutting Screws; H. A. Harvey, Assignee (through mesne-assignment) of Thomas W. Harvey, late of City of New York; patented May 30, 1846; re-issued December 28, 1858.

Claim—1st, The combination and arrangement of two inclined rollers, one or both rotating, and placed at a sufficient distance apart to permit the shanks of the blanks to hang therein freely suspended by their heads and for the purpose of arranging the blanks (when presented in a promiscuous mass) all in a row, with their heads up, and causing the row to travel to the lower end, and to be delivered one by one. 2d, Combining with the delivery end of the inclined rollers, or equivalent ways, for supplying the blanks in order, a delivery and check slide, and a receiving and conducting tube, or equivalent therefor, to receive the blanks from the row, deliver them one by one, and conduct them to the place where they are required for after operations, and at the periods required. 3d, Combining with the receiving and conducting tube, a transferer, or equivalent therefor, to receive the blanks from the conductor and transfer them to the mandrel or place where they are to be subjected to the cutting action. 4th, Combining with the mandrel or spindle, and with suitable means for holding the screw blanks in line, a sliding twin screw and spring, or equivalent therefor. 5th, Governing the motions of the chaser towards and from the axis of the blank, by combining the chaser with a carriage and sway bar moved by a cam, and also connecting one end of the sway bar with an adjusting slide, when this is combined with a chaser or chaser head, whereby the amount of taper to be given to the screw can be regulated at pleasure. 6th, Changing the directions of the various cam grooves by means of sliding switches, operated by sliding rods within the hollow cam shafts, and shifted by an index cam, by which the various changes of the motions of the machines are effected. And, finally, making the cam which operated the sway bar adjustable on its shaft, for the purpose of adjusting the motions of the chaser to the length of the blank, to insure the proper formation of the point of the screw.

11. Gas Burners; J. R. Foster, Boston, Mass., Assignee of A. H. Wood; patented September 21, 1858; re-issued December 28, 1858.

Claim—1st, The flame spreaders, consisting of the ring pieces extending outwardly from the gas orifice. 2d, The heaters, combined with the jet gas burners. 3d, Combining with the jet gas burner a draft cone, the top of which terminates at or near the level of the gas orifice.

Designs.

1. Metallic Coffin; Wm. H Forbes, City of New York; dated December 7, 1558.

2. Cooks' Stoves; G. D. Sprecher, Lancaster, Pennsylvania; dated December 7, 1858.

3. Parlor Stoves; Garrettson Smith and Henry Brown, Assignors to Leibrandt, McDowell & Co., Philadelphia, Pennsylvania; dated December 14, 1858.

4. Cooks' Ranges; Garrettson Smith and Henry Brown, Assignors to G. Abbott and A. Lawrence, Philadelphia. Pennsylvania; dated December 14, 1858.

5. Book Marks; Wm. B. French, Charleston, Massachusetts; dated December 14. 1858.

JANUARY 4.

1. Automatic Boiler-feeder; Henry B. Adams. Brooklyn, New York.

Claim—The arrangement and combination of the chambers, shell, and adjustable weight. Also, the combination of the valves with the chambers, for the purposes described.

2. Manufacture of Umbrella Rings; Jonathan Ball, Elmira, New York.

Claim—An umbrella ring having the ends of the ribs or the stretchers and the wire to confine them cast within.

3. Grinding Mills; Thomas Bennett, City of New York.

Claim—The adjustable conical shell, in combination with the grinding cone, placed or secured upon a shaft having no end play or longitudinal or adjusting movement. Further, in combination with the adjustable shell and cone, the cob-cutter permanently attached to the shaft, and having its shell fitted over the end of shell, for the purpose set forth.

4. Elastic Saddles; Lewis Bishop, Talladega, Alabama.

Claim—A saddle having a seat suspended on springs, by means of loops and eyes, and otherwise made as described.

5. Corn Shellers; Michael Bomberger, Hummelstown, Pennsylvania.

Claim—So arranging the rollers (provided with helical springs), in combination with the loose rings, as to operate in the manner set forth. Also, the employment of the loose bar when arranged with rollers, helical springs, adjusting bars, and shelling cylinder, substantially as described.

6. Horse Rakes; Wm. H. Brown, Middletown, New York.

Claim—The arrangement and combination of the segment rack, toothed sector and arm, rod, lever, and frame, as described.

7. Harvesters; A. C. Brownlick, Buffalo, New York.

Claim—The axle, in combination with the pinions, shaft, and pillow block, constructed substantially in the manner described.

8. Seed Planters; Joel Bryant, Brooklyn. New York.

Claim—In connexion with the cultivating plough, the seed-planting apparatus consisting of the drill plough, seed box, seed slide, driving rod, covering wheel, and sod-clearer, substantially as described.

9. Apparatus for Hoisting and Dumping Coal; W. B. Culver, Scranton, Pennsylvania.

Claim—The arrangement and combination of the rod, bars, bail, and inclined guides, as described.

10. Rocking Chair; David Buzzell, Charlestown, Massachusetts.

Claim—In combination with the chair-stand or frame, the movable leg-rest, and the sliding foot applied to such leg-rest, a mechanism by which, when the leg-rest is moved or swung upon its fulcrum or bearings, the sliding foot-rest shall be moved on its supports either toward or away from the seat. Also, the combination of the foot levers and the rockers applied to the chair or seat frame, and so as to operate together. Also, the combination of the toggles, the lifting levers, and their connexions with the foot levers and rockers, the same being for the purpose of so operating the said rockers and levers as to cause the chair to be supported on the ground or floor either by the two rockers or the four foot levers. Also, so combining a foot-rest with a movable or turning leg-rest, that the former shall be movable relatively to the latter, as specified.

11. Cotton Cultivators; Calvin Cannady, Indianapolis, Indiana.

Claim—1st, The two shares or blades when placed obliquely with each other, pivoted to their respective standards and adjusted by the rod, nut, and fork. 2d, The employment or use of the reciprocating hoe attached to the bar, which is connected with the rod, the hoe being operated through the medium of the cam, and spring, in connexion with the pin and springs, so that the transverse movement of the hoe relatively with the row of the plants will be obtained, and also of a vertical movement to allow the hoe to clear the plants when passing over them previous to each thinning out stroke. 3d, The lever, when applied to the rod and used in connexion with the thinning hoe, substantially as set forth.

12. Carpet Fan Sweeper; Augustus C. Carey, Lynn, Massachusetts

Claim—The use of a fan for the purpose of sweeping the carpet or other surface, in place of the revolving brush heretofore employed for the purpose.

13. Cooking Range; Gardner Chilson, Boston, Massachusetts.

Claim—As my improved arrangement of flues against the bottoms, the outer sides, the tops, the inner sides, and in rear of the two ovens, whereby the smoke after passing over the tops of the two ovens, or either, is made to descend between them, and pass out into the back flue, in manner as described; and with the said arrangement of flues or the parts thereof to which the same specially belong, or in other words, the top and diving flues of the two ovens, I claim the arrangement and application of a curved valve and its arched recess. Also, the protector plate, as combined and arranged with reference to the fire-place, the two ovens, and the flue between the two ovens, and so as to support the ovens. Also, the described mode of making the upright flue leading from the fire-place or boiling chamber to the flue space about the oven, such being made with a reflecting back and tapering sides, and in other respects substantially as specified. Also, the expansion safety plate as arranged with respect to the fire-place, and applied on the top plate of the boiling chamber, in the manner specified.

14. Smut Machines; Everard M. Clark, Lancaster, Pennsylvania.

Claim—The diagonal grooved wings or beaters, the upper and lower grooved wings or beaters, the two sliding valves on the bottom of the machine, for regulating the draft, when combined substantially as set forth.

15. Billiard Cue Tips; H. W. Collender, City of New York.

Claim—A cue leather or cue tip, coated on its flat surface with a soluble gum or cement, as described.

16. Construction of Spectacles; John Burt, Hartford, Connecticut, and William W. Willard, Syracuse, New York.

Claim—The employment of the link joint to the nose piece. Also, the construction and arrangement of the short bows, springs, cup, or pads, substantially in the manner described.

17. Bandboxes; George H. Dickerman, Boston, Massachusetts.

Claim—The combination of a removable standard with the paper bandbox, arranged substantially in the manner described.

18. Cultivators; John B. Duane, Schenectady, New York.

Claim—The arrangement and combination of the frame, D, having wheels, g, bar, F, wheel, G, bar, E, and frame, A, as described.

19. Escapement for Time-keepers; John W. Einhaus, City of New York.

Claim—The use of a triangular-shaped pallet lever for an escapement pallet for clocks, watches, &c., with an escapement wheel, constructed in the manner set forth—but irrespective of such use of my block pallet, I make no claim to the construction of the escapement wheel of itself, as my invention relates exclusively to the use and application of the block pallet.

20. Spading Machines; George B. Field, St. Louis, Missouri.

Claim—Propelling the shovels by means of single cranks attached to handles, and guided by adjustable arms or levers, so that the lower end of the shovels, when in motion, shall run in separate lines or furrows, substantially as described.

21. Washing Machines; Micah Gillam, Alba, Pennsylvania.

Claim—The beaters or lifters arranged upon the rocker shaft within the half cylindrical tub lined with anti-friction rollers, the rocker shaft being operated by the lever, vertical shaft, and connecting rods.

22. Means of Operating Carriage Brakes; Wm. Gourley and Isaac Krebs, Winchester, Virginia.

Claim—The construction and application of the compound or double lever, and the crank-shaped rubber rod or brake bar, and T-shaped spring, when combined and operated substantially as described.

23. Machine for Sawing Laths; E. H. Hancock, Augusta, Georgia.

Claim—1st, The combination of the peculiar spirally-toothed feed rollers, G G′, ordinary toothed or fluted feed rollers, H H′, and obliquely set guide or gauge, when arranged relatively to the saws, for the purposes set forth. 2d, The combination of the rollers, G′ H, swinging frames, shaft, pinions, spur-wheel, and cog-wheel, substantially as set forth. 3d, The arrangement of the swing table bearing a portion of the machinery with respect to the frame, and the rest of the machinery thereon, as set forth.

24. Bee-hives; J. S. Harbison, Sacramento, California.

Claim—1st, The graduating chamber, in combination with the curtain and ventilating passages, whereby air is admitted without light into the hive. 2d, Providing the adjustable sectional comb frames with the flexible metal clamps, when the frames are constructed and arranged in the manner described. While not claiming, broadly, the removal of a tier of boxes at one operation, nor the boxes of a tier separately, by means of a clamp, irrespective of the mode of construction, I do claim:—3d, The device composed of the parts, L f d c, in combination with a horizontal tier of boxes, arranged and operated as described.

25. Coffee Pots; J. W. Hedenberg, St. Louis, Missouri.

Claim—The application of the chimney or pipe to the open space between the coffee pot and the condenser, for the purpose of causing a current of cold air to pass between the coffee pot and condenser, as set forth.

26. Rotary Harrows; Charles Howell, Cleveland, Ohio.

Claim—1st, The arrangement and combination of three rotary harrows, when the axis of each is inclined, in the manner described. 2d, The arrangement of the hook in relation to the front harrow, when combined with two harrows in the rear, arranged to operate in the manner set forth.

27. Method of Operating the Valves of Pumping Engines; L. J. Knowles, Warren, Massachusetts.

Claim—1st, Controlling the motions and positions of the plunger exclusively by steam admitted from the steam chest, and by suitable exhausts. 2d, The described arrangement of the induction ports with respect to the exhaust ports, and with respect to the throw of the plunger, for the purpose specified. 3d, Admitting a quantity of steam before the advancing plunger through the passages, for the purpose of arresting its motion. 4th, The secondary exhaust ports, operating as described. 5th, The peculiar construction of the main valve, whereby the pressure upon the same is relieved, as it passes the centre of its throw, and the piston is caused to start more gradually, as set forth.

28. Means of Operating Carriage Brakes; Isaac Krebs, Winchester, Virginia.

Claim—The levers with movable fulcrum, the sliding adjusting connexion rod and tap, the slotted clip or fulcrum support, and the spring rubber, when constructed as described.

29. Machines for Sowing Guano and other Fertilizers; J. H. Leach, Oakville, Maryland.

Claim—The arrangement of the covering section of the drill within the frame of the roller section—and in connexion therewith, the arrangement of the box between the hopper and distributing spout, the box being attached to the hopper by pliable or elastic material, and being vibrated with the spout by the toothed wheel upon the axle, as described.

30. Railroad Sleeping Cars; T. Luce and J. H. Morrison, Detroit, Michigan.

Claim—The folding berth bottoms attached at each side of a central partition within the body of the car, in connexion with the double row of single seats at each side of the car, with a passage way between them, the innermost row of seats at each side of the car being provided with falling backs.

31. Railway Alarm; Henry Maule, Philadelphia, Pennsylvania.

Claim—The employment of the lever, or its equivalent, in combination with an extra rail and with the steam whistle, substantially as described, for sounding the steam whistle at any desired part of the road.

32. Cutting and Punching Iron; A. J. Peavey, South Montville, Maine.

Claim—The cylindrical die-box, in combination with the circular punch socket, both punch and die being by their means capable of revolution upon their axes and adjustment to the required angles of the teeth of the saw to be gummed. I do not claim the dividing plate and the parts necessary for its convenient operation,

nor operating the punches by lever and cam, separately considered. But I do claim the combination of the dividing plate and its appendages, with the punching apparatus, in the manner and for the purpose specified.

33. Spoke Machine; N. Olney and C. H. Kellogg, Amherst, Massachusetts.

Claim—The expanding cutter heads in connexion with the guides or patterns attached to the reciprocating carriage, in which the stick to be operated upon is placed; the guides or patterns actuating the cutter heads respectively by means of the mechanism. Further, in combination with the expanding cutter heads, and the guides or patterns on the carriage, the circular saws fitted in the frame, operated automatically by the carriage, substantially as set forth.

34. Corn Harvesters; R. C. Mauck, Conrad's Store, Virginia.

Claim—1st, The bearing wheel, arranged substantially as set forth. 2d, The combination of the bearing wheel and the rest block for submitting the stalk to the knife in the best manner to effect the cut. 3d, Guiding the machine by the passage of the groove over the stumps of the cut products.

35. Revolving Fire Arms; C. S. Pettengill, New Haven, Connecticut.

Claim—1st, Combining the hammer and the rotating dog with the trigger, by means of a forked tumbler and a cam working on the same pin, the said cam being formed with a notched tail to engage and operate in combination with a horn on the trigger, substantially as set forth. 2d, The bent dog, applied as described, on a fixed conical steed on the centre of the rear of the breech, supported and combined with a cam on the tumbler pin, to operate substantially as described. 3d, The arrangement of the helical main spring upon a bolt which is jointed to the hammer, and which slides through a fixed guide in the rear thereof, substantially as described.

36. Machine for Ditching, Grading, &c.; Wm. Provines, Columbia, Missouri.

Claim—The arrangement and combination of the elevators, rods, shaft, f, disk, and shaft, g, substantially as described.

37. Machinery for Pointing the Teeth of Hair Combs; C. B. Rogers, Deep River, Connecticut.

Claim—Forming the recesses at the centre and from the edges of the periphery of the wheel toward its centre, so that each recess shall extend only partially across the periphery of the wheel, and still cutting surfaces be formed entirely across it, without breaking or dividing the screw-thread entirely across the wheel at any one point, substantially as set forth.

38. Sifting Shovels; Paul A. Sabbaton, Albany, New York.

Claim—A screening shovel, composed of malleable cast iron, and otherwise made as described.

39. Grinding and Crushing Mills; Gelsten Sanford, Poughkeepsie, New York.

Claim—1st, The arrangement and combination of a conical grinding surface with a concentric shell, composed of stationary and adjustable wedges or staves, which are provided with a means of adjustment, substantially as described. 2d, The arrangement of the projecting surfaces of the cone, so that by reversing the direction of the rotation of the cone, small or large bodies may be crushed and ground in the mill.

40. Lamps; Wm. F. Shaw, Boston, Massachusetts.

Claim—The foraminous deflector described, operating in the manner set forth. Also, the foraminous deflector, in combination with the perforated bottom air chamber, as set forth.

41. Sewing Machines; Isaac M. Singer, City of New York.

Claim—Placing the spool within the shuttle without any attachment, so that the heads thereof shall run in contact with the case of the shuttle, to give the required drag. Also, in combination with the shuttle case, and the spool placed therein without any connexion, the employment of the spring plates to form spring bearings for the pivots of the spool, as set forth. Also, the shuttle case and spool placed therein without any attachment, in combination with the enclosing plate and the face of the shuttle race, by means of which combination the spool is held in place by simply placing the shuttle in its race.

42. Franklin Stoves; David Stuart, Philadelphia, Pennsylvania.

Claim—Forming the fire back of such stoves by the front wall of a cell or chamber, around or on both sides of which the draft passes, and through which the air circulates, said cell or chamber being constructed and connected with the stove in the manner set forth.

43. Lithographic Printing Press; Wm. Hermann Stuble, Boston, Massachusetts.

Claim—1st, The cylinder of rollers, in combination with a revolving tympan and scraper, operating as set forth. 2d, The method of interrupting the motion of the gears and of again engaging them with the rack, by means of cams, lever, and pin, operating in the manner set forth. 3d, Hanging the parts which operate the scraper on springs, in the manner specified.

44. Cultivators; George W. Tolhurst, Liverpool, Ohio.

Claim—The arrangement of the flanched quadrants, pivots, clamp hook, braces, teeth, and rigid frame, in the manner described.

45. Catch for Hanging Drapery; Alonzo and Cyrus A. Warner, Bristol, Connecticut.

Claim—The spring catch, constructed as specified.

46. Mode of Operating Drain Ploughs; Daniel Watson, Newport, Ohio.

Claim—Combining with the crab or anchor and the plough, traveling capstans, which are connected together by a rope or chain, as represented, for the purpose of working said plough.

47. Corn Sheller; Wm. Wells, Boston, Massachusetts.

Claim—The arrangement and combination of the shelling wheel, guide, clearer, and weighted or spring presser, constructed in the manner described.

48. Copying Press; Alonzo Whitcomb, Worcester, Massachusetts.

Claim—When the screw is arranged to pass through and traverse a nut in the cross-bar, I claim connecting the screw and platen with each other in presses, by means of a cap on the upper side of the platen, with a spiral thread in its interior to correspond with the thread on the lower end of the screw, as described.

49. Screw Propeller; Benjamin F. Bee, Harwich, Assignor to self and James A. Woodbury, Boston, Mass.

Claim—The combination of the cylinder with the longitudinal plates, as described.

50. Horse Rakes; B. Bridendolph, Assignor to self and O. K. Borey, Clear Spring, Maryland.

Claim—The arrangement of the handles, rake head, shafts, runners, and links or rods, for the purpose set forth.

51. Attaching Handles to Cutlery; Matthew Chapman, Assignor to the J. Russell Manufacturing Co., Greenfield, Massachusetts.

Claim—Placing the handles in the rough on the tangs of the implements, with or without the rivets, and compressing the same while on the tangs into proper form by means of dies, as set forth.

52. Manufacturing Webbing; James C. Cooke, Assignor to the Russell Manufacturing Company, Middleton, Connecticut.

Claim—A fabric or belting made not only of two or more sets of body warps, and a single filling thread passed through the decussations of the said warps, alternately or otherwise, but with confining warps arranged and crossed on the filling, and between the body warps and at various or numerous intervals between the two edges of the fabric, so as to bind together the cloths made by the body warps, and form them with no straight or continuous parallel ridges.

53. Method of Bending Wood; Robert Fitts, New Ipswich, New Hampshire, Assignor to C. and G. C. Winchester, Ashburnham, Massachusetts.

Claim—Bending a piece of wood around a fixed form, by means of the series of blocks, levers, and connecting bars. Also, in combination with the above, the spring face plate attached to the blocks, in the manner specified.

54. Bridge Walls in Boiler Furnaces; Wm. G. Hamilton, Assignor to John C. Hamilton, City of New York.

Claim—The hanging of the bridge wall upon an axis, in the manner described, or equivalent, by which it is made capable of being folded down out of the way, and also the making of the axis hollow, terminating with an opening forward, as described.

55. Electro-magnetic Telegraphing; David E. Hughes, Assignor to the American Telegraph Company, City of New York.

Claim—Introducing into that portion of the electric current which passes to the opposite pole of the machine. at the station where the operator is working, a retarder, such substantially as herein described, whereby said portion shall not reach the near ground plate until after the other portion of the same current shall have passed over the line wire and reached the distant ground plate, whereby said current is enabled to flow through the machine situated at the place of the operator, as aforesaid, without setting said machine in motion, substantially as described.

56. Manufacturing Corsets and Bustles; Damase Lamoureux, Assignor to Alexander Douglas and Samuel S. Sherwood, City of New York.

Claim—A corset and bustle, when constructed in the manner described.

57. Looms; Stephen C. Mendenhall, Assignor to Isaac Lamb, Richmond, Indiana.

Claim—1st, The treadle roller, carrier, and spring, in combination with the scroll cam, arranged in the box, for the purpose of operating the treadles substantially in the manner described. 2d, The hook having an adjustable and hinged attachment to the breast-beam, when combined with a set-screw to determine its position, and operating in the scroll cam, in the manner set forth. 3d, The combination with the treadle of the graduated series of mortises and pin, for the purpose of regulating the width of the shed. 4th, The combination of the picker spring, sliding catches, triggers, and straps, for the purpose of throwing the shuttle, as set forth. 5th, The combination of the double eccentric pulley and straps with the set-screws, for the purpose of expanding the picker spring in such a manner as to equalize the power at each forward motion of the lay or batten.

58. Lasts; Goodloe H. Taylor, Shelburne, Assignor to self and Wm. Sherwin, Shelburne Falls, Mass.

Claim—So pivoting the hook or lever as that the strain shall come upon said pivot and not upon the spring, by which means I effect a better and more certain fastening.

59. Sealing Cans and Bottles; James D. Willoughby, Carlisle, Pennsylvania, Assignor to C. M. Alexander, Washington City, D. C.

Claim—1st, The arrangement of the disks, screw, and top with the rubber, in such a manner that when the rubber is compressed its periphery will press tightly against the insides of the can or bottle mouth, while its centre presses against the rod or screw, for the purpose of effectually excluding the air. 2d, The subject of the first claim in combination with the neck of the bottle or can, as constructed.

60. Burners for Vapor Lamps; Ephraim D. Rosencrantz and Willard H. Smith, Assignors to said Rosencrantz and Barton E. Clark, City of New York.

Claim—The employment of a tube for holding the wick, when provided with a plate and perforations, for the purpose set forth. Also, the employment of a cup or heater having perforations tangential to its periphery, when used with a wick tube, in the manner set forth.

61. Coffins; Charles E. H. Richardson, Philadelphia, Pennsylvania.

Claim—The construction of a coffin or casket, made air and moisture tight by a double lining of cloth and cork, prepared and combined in the manner described.

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62. Composition for Friction Matches; Wm. Paggett Allen, Dubuque, Iowa.

Claim—1st, The combination of phosphorus with the substances marked, b and c, in the proportions and manner set forth. 2d, The combination of phosphorus with the substances marked d and e, in the said proportions and manner. 3d, The combination of phosphorus with the substances marked a, in said proportion and manner.

63. Roller for Expressing Water from Clothes; John Allender, New London, Connecticut.

Claim—A roller consisting of a spirally coiled spring, arranged on a shaft or roller made smallest in the middle (to allow the spring to yield), covered with india rubber, or some flexible material, that will yield or bend readily as the spring yields to the cloth, clothes, or other article being squeezed by the rollers.

64. Door Spring; James Barkley, Weston, Missouri.

Claim—The employment of the spring which shall be provided with a hook at one end, and which shall be secured to the casing at the other by means of two half staples, thus making a spring, which is adjustable to both ends, capable of being detached from either the door or casing in a moment of time.

65. Canteens; Benjamin Beers, New Fairfield, Connecticut.

Claim—The combination with said canteen, of the additional vessel made by hollowing out a piece of wood and inserting its edge in a groove in the end or head.

66. Method of Securing together the Sides of Cast Metal Columns; A. J. Bowers, Richmond, Virginia.

Claim—Securing the plates or sides of metal columns together by means of the projections, ledge provided with notches, and the wedges, as described.

67. Water-closet; Thomas Birch and Lewis Bradley, Hartford, Connecticut.

Claim—The arrangement of the metallic rim, arm, disk, cap, and lever, in the manner described.

68. Artificial Manure; Duncan Bruce, Paspebiac, Canada.

Claim—The manure manufactured by the described process, the animal matters being first decomposed in the manner set forth, and subsequently disinfected by charred shale, or its equivalent.

69. School Desk and Chair Combined; George Buchanan, Hickory, Pennsylvania.

Claim—A seat pivoted near its front edge to a stationary frame, and hinged near its near edge to a movable back, and having its arms pivoted by their rear ends to the movable back, and hinged to the stationary frame.

70. Devices for Setting Laterally Circular Saws; J. D. C. Carpenter, Cincinnati, Ohio.

Claim—The rock shaft connected with arms and acting as an eccentric or as two cranks for adjusting the saw shaft laterally.

71. Burglar-proof Safe; John B. Cornell, City of New York.

Claim—Combining a cast iron door frame with the wrought iron portions of the frame of a safe, in such a manner that the molten iron, which is afterward, whilst in a melted state, combined with the said safe frame will form a burglar-proof protecting casing around the said door frame.

72. Lathe Attachment for Finishing Dental Plates; Elijah H. Danforth, Jamestown, New York.

Claim—The combination of the mechanical devices specified, consisting of the piston, bed-pieces, boxes, slides, and the crank. Also, the adjustable crank as it is arranged and attached to the specified parts of this machine, as set forth.

73. Soda Water Apparatus; Thomas Daniels, Toledo, Ohio.

Claim—1st, The arrangement of the whole apparatus, the syrup cans being elevated above the refrigerator, which is provided with the group stop cock. 2d, The arrangement of the tubes for conducting the syrups and the water to the top of the ice chamber, without cooling them, and concentrating the cooler portions of these liquids below the ice near the place of discharge.

74. Method of Securing the Cylindrical Balance Springs of Watches; A. L. Dennison, Waltham, Mass.

Claim—Placing the cylindrical spring beneath the balance and between it and the fork, and cutting away the upper plate to furnish room for its accommodation.

75. Lewis for Attaching Tackles to Blocks of Stone; Eugene Duchamp, St. Martinsville, Louisiana.

Claim—A lewis composed of a shell, air pump, nozzle or tube, packing, staple, and otherwise made as described.

76. Endless Conveyors for Removing Earth; Samuel Falwell, Memphis, Tennessee.

Claim—1st, The series of sectional cars in an endless connexion, each car being provided with terminal or track wheels, and intermediate wheels of varying and lesser diameter than the track wheels and shoulder stops, or equivalents thereof. 2d, The combination of such cars with an upper and lower track and wheels, as set forth.

77. Electro-magnetic Fire Alarm Apparatus; Moses G. Farmer, Salem, Massachusetts.

Claim—The circuit wheel and the crank or handle by which it is actuated, in combination with the key and the electro-magnetic circuit, operating to send a definite signal from a sub-district to the central station. Also, the method of completing the circuit, when the door of the signal-box is closed, through the springs, as set forth.

78. Door Spring; John S. Gray, City of New York.

Claim—The combination of the socket, bolt, and hold-fast, with the torsion spring, constructed as set forth.

79. Washing Machine; J. R. and J. S. Haldeman, Bloomington, Illinois.

Claim—1st, The arrangement of the springs and supporting beams, in connexion with the sliding frame that carries the lower series of fluted rolls. 2d. The clasp, constructed as set forth. 3d, The sliding standard, or its equivalent, in combination with the rack bar and pawl, as set forth.

80. Washing Machine; Eden S. Howell, Hope, New Jersey.

Claim—1st, The combination of the live rubber with the horizontal sliding and rotating shaft, vibrating pressing lever, and ratchet, or its equivalent. 2d, In combination with the rocking and pressing rubber, the perforated rubber partition. 3d, The detachable lever and bar, substantially as described.

81. Flail Caps; Thomas J. Hubbard, Hamilton, New York.

Claim—The construction of flail caps, of casting metals in separate parts or sections, with the lip or crescent tongue formed upon the interior thereon, as described.

82. Preparation of Resins; Edward Hunt and Henry Davis Pochin, Talford, England; patented in England, April 27, 1858.

We are aware that stills and steam worms, capable of distributing small jets of steam, have been before used in a somewhat similar way for the treatment of oils and fatty matters, and for improving the quality of resin oil obtained from substances similar to those used by us in the processes described But such a process has never, so far as we can ascertain, been applied to any such substances as are proposed to be operated upon by our processes, for the purposes of obtaining the resinous and solid products specified as the result of our said processes We therefore

Claim—The new article of commerce specified, as produced by the processes mentioned, or by any similar mode or process, said articles or products not having been hitherto known in commerce or used in the arts.

83. Sausage Stuffer; R. V. Jones, Johnstown, Pennsylvania.

Claim—The piston rod and supporting recess, constructed as described, in combination with the pronged nut and screw.

84. Treatment of India Rubber; Henry W. Joslin, Trenton, New Jersey.

Claim—The use and employment of sulphuret of zinc, either artificial or native, substantially prepared by the aforesaid process described, in combination with india rubber, for the purpose of curing or vulcanizing it in form and manner as set forth, without the use of free sulphur in any way in combination with the rubber.

85. Stump Extractors; John L. Knowlton, Glassborough, New Jersey.

Claim—The lever with its catches, in combination with the hauling chain and springs, or their equivalents, when the said chain is guided so as to prevent it from twisting or from moving laterally or vertically.

86. Horse Collars; Oliver Lapreniere, City of New York.

Claim—A horse collar, having its lower part provided with a metallic tube, to give form to and hold the packing.

87. Roofing Compositions; Henry Lester, Cincinnati, Ohio.

Claim—A composition for roofing, and similar purposes, produced from the mixture of the ingredients described, in the proportions and for the purposes set forth.

88. Taper Gauge for Carpenters; John Marvin, Bellport, New York.

Claim—The employment and use of a conical roller applied to a block or a stock of the gauge, and connected with a rack or the pencil bar, in the manner shown, or in any equivalent way, so that the roller will be rotated as the gauge is shoved along. and the bar moved longitudinally by the rotation of the roller, so as to produce the desired result. Further, in combination with the conical roller, the adjustable band and f nce, applied to the block or stock, for the purpose of regulating the degree of taper of the line, substantially as described.

89. Metallic Cartridge Cases; Edward Maynard, Washington City, D. C.

Claim—An improved metallic cartridge, composed of a brass cup combined with an exterior steel disk, substantially as set forth.

90. India Rubber Hose Pipes; Charles McBurney, Roxbury, Massachusetts.

Claim—A semi-elastic composition pipe, compounded of the ingredients and in the proportions substantially specified, when vulcanized, as set forth.

91. Machine for Sawing Shingles from the Bolt; Alex. R. McCans, Ashley, Missouri.

Claim—In combination with a saw hung in a swinging arm, the spur, rack, and sliding bar. for drawing said saw through the bolt, to sever the shingle therefrom, and to trip and allow the saw to fall back for the next similar operation. Also, in combination with a pivoted table for holding the bolt. the shifting bars, for bringing the bolt up to the saw in such a manner as to alternately reverse the ends of said bolt, from which the butts and points of the shingles are cut, as set forth.

92. Railroad Car Seats; Thomas E. McNeill, Philadelphia, Pennsylvania.

Claim—1st, Jointing the ends of the arm-rests to the ends of the upright standards at the corners of the seats, and providing their opposite ends with sliding bolts or bars, and right-angled plates. and half pivots or pins for enabling their attachment, when in a horizontal position, by the bars and their upright elevation, to form a support for the hinged portions of the backs, when the seats are swung round upon the crank bars. 2d, The combination of the hinged board, with the projecting ledges on its surface, with the box-like frame forming the rest of the bottom of the seat, next the end of the car in which it can be enclosed. 3d, In combination with the swinging seats, the box-like frames and the platforms, attached to the same by the cranks and jointed bars.

93. Stone-cutting Machines; George Morgan, Brooklyn, New York.

Claim—The arrangement of cutters of gradually increasing length, in such relation to hammers and to a sliding carriage, that by the action of the hammers on the cutters an incision is made through the whole length of a block of stone, which is placed on the carriage.

94. Apparatus for Increasing Draft of Chimneys; Antoine Niel, Brooklyn, New York.

Claim—The arrangement of the exterior tube, having the expanded conical and cylindrical portions constituting the chamber of compression. and the contracted annular space between the two tubes above the conical part of the tube with the inner tube, the two tubes bearing the relation to each other as herein set forth.

95. Bridle Bits; Antoine Niel, Brooklyn, New York.

Claim—1st, The combination of the griper bars with the bars of the bit of the horse. 2d, Attaching the griping bars by their double-eyed ends and by the screw nuts to the bars, as set forth.

96. Spectacle Frames; Theodore Noel, Memphis, Tennessee.

Claim—The employment of springs applied to the frame, as specified.

97. Retorts for Distilling Oil from Coal; James O'Hara. Pittsburgh, Pennsylvania.

Claim—The employment in an upright retort for distilling coal, of a revolving screw, of a circumference smaller than the interior of the retort, so applied that while by its revolution it produces a continuous elevation of the central portion of the charge, it permits and causes a continuous descent of the surrounding portion by gravitation, and thus produces a positive continuous and uninterrupted upward and downward circulation.

98. Gas Burners; Albert Ostrander. City of New York.

Claim—The manufacture of gas burners, made of the composition of felspar, quartz, and asbestos, having the peculiar formation of the vents set forth.

99. Artificial Fore Arms; B. Frank Palmer, Philadelphia, Pennsylvania.

Claim—1st, Closing the hand by means of a strap, operated by an attachment to the shoulder of the opposite arm. 2d, The clamp, constructed and operating as described, and applied to the purpose specified.

100. Manufacture of Sugar; Edmond Pesier, Valenciennes, France; patented in France, March 29, 1858.

Claim—The treatment of the saccharine juices of plants, in the manner described, by the use of alcohol, in combination with other special agents.

101. Artificial Arm and Hand; B. Frank Palmer, Philadelphia, Pennsylvania.

Claim—1st, Giving a sinuous course to the flex or tendons of the fingers, by means of the sheaves, for the purpose described. 2d, Opening the fingers by means of extensor tendons, antagonizing the flexors by means of springs. 3d, The wrist-joint, constructed as described, of a ball and socket held in contact by cords, arranged and operating as specified. 4th, Giving a soft and elastic covering to the shaft and the wrist, for the purpose of imitating the changes of form which take place in the natural arm, during the movements of the radius and the play of the pronator and supinator muscles. 5th, The mode described of attaching the arm to the body.

102. Peg Cutters; E. R. Pease and R. R. Hayman, Poughkeepsie, New York.

Claim—The described machine for cutting off or removing pegs and nails from the insides of boots and shoes.

103. Inkstand; G. M. Prentiss, Worcester, Massachusetts.

Claim—An inkstand, having a plunger, constructed and fitted as described.

104. Corn Harvesters; Isaac Reamer, Conrad's Store, Virginia.

Claim—1st, The combination of the elastic lower guide with the adjustable upper guide, when these parts are arranged in the manner described. 2d, The arrangement and combination of guide and swinging clearer for removing the corn from the platform, in the manner described.

105. Detaching Paper from Vulcanized Gum; Albert C. Richard, Newtown, Connecticut.

Claim—Subjecting the surface or surfaces of vulcanized india rubber, gutta-percha, or other elastic gum, sheets, valves, belts, or other objects, which have been so vulcanized or cured between or on paper, and to which the paper adheres, to a mechanical process of regular bending and continual elongation, having the continuous effect of drawing or detaching the filaments or atoms of the elastic gum, which adhere to, or which have entered into the pores of the paper, gradually and regularly therefrom and thereout, simultaneously across the whole width of the surface operated upon, in the manner as set forth, or in any other manner producing substantially the same result.

106. Framing Square; Wm. Ripley, Edgartown, Massachusetts.

Claim—Framing square made with its bearing ledge, its squaring arms, mitre slots, and mortising slots, arranged together and with respect to a base rule.

107. Machinery for Oiling the Journals of Locomotives; Stephen Scotton, Richmond, Indiana.

Claim—1st, The combination of the weighted shaft, the spiral spring, and the box, with the journal of locomotive carriage. 2d, The metal cup, in combination with the box and upright shaft, or their equivalents. 3d, The nut, when combined with the upright shaft and cup, or their equivalents, in the manner specified.

108. Treating Auriferous and Argentiferous Pyrites; Lewis Solomon, City of New York.

Claim—1st, Extracting gold and silver from auriferous and argentiferous pyrites, in the manner substantially as set forth. 2d, The application of wood ashes to the roasted ore during the process of grinding, and of soda ash, for the purposes specified.

109. Grinding Surfaces for Mills; O. W. Stanford, Cincinnati, Ohio.

Claim—The employment of a system of circular grinding teeth, when arranged in the manner set forth. Also, arranging around the outer surface of the disk intercepting V-shaped teeth, to operate in the manner specified.

110. Trip Hammers; Casper V. Statter and George W. Wilson, Walnut Grove, Illinois.

Claim—Arranging a hammer in such relation to an anvil, by means of levers and links, that the same can be operated by means of a hand lever or by foot levers. Also, the arrangement of the hand lever in such relation to the foot levers and to the chisel, that both the hammer and the chisel may be operated by the motion of the hand lever. And in combiuation with the above described hammer, we further claim connecting the handle of the chisel with the arm, by means of an adjustable rod, so that the cutting edge of the chisel may be accommodated to different thicknesses of iron.

111. Desiccating and Clarifying Cane Juice; Richard A Stewart, St. Bernard's Parish, Louisiana.

Claim—As new in the desiccation and clarification of cane juice, and other liquid or semi-liquid forms of saccharine matter, disseminating throughout the same sulphurous gas, or sulphurous acid gas, for the purposes set forth.

112. Gas Retorts; H. K. Symmes, Newton, Massachusetts.

Claim—Dispensing with the mouth-piece of the ordinary horizontal gas generating retort, and dividing the mouth of the retort into two portions, one of which is brought into permanent connexion with the stand pipe, the other being employed for the purpose of charging the retort.

113. Manufacture of Candles; Joel H. Tatum, City of New York.

Claim—A candle, having its stock composed of tallow, stearic acid, and gum camphor, with or without bees-wax, in about the proportion specified, and the exterior of the candle covered with a compound composed of stearic acid, gum camphor, and gum damar, or equivalent flux, in about the proportions set forth.

114. Mode of Constructing Slats for Blinds; Wm. E. Worthen and John J. Althause, City of New York.

Claim—A sheet metal blind slat or luffer board, made up of the combination of a slit tube, with two thicknesses of sheet metal.

115. Hardening Fatty Substances; Benjamin C. Tilghman, Philadelphia, Pennsylvania; patented in England, May 2, 1857.

I do not claim, generally, the process of hardening fatty substances by sulphuric acid, as I am aware that this has been before proposed: but in such cases, the heat employed has been under or above 212° Fah. Now, I have found that the hardening effect of sulphurous acid is very greatly increased by causing it to act upon the fatty substances at more elevated temperatures, preferring from about 350° to 550° Fah., but which may be varied from a little above 212° Fah., to above the distilling point of the fatty substance, and it is to this modification of the process that the part of my claim extends and is confined. I am also aware that it has been before proposed to decompose fatty substances and soaps into fat acids, and to purify fatty substances from mucilage, gelatine, &c., by means of sulphurous acid, and also to subject fatty substances to the action of strong sulphuric acid, whereby sulphurous acid is generated in the fat itself—and I wish it to be understood that I make no claim to any of the above processes.

Claim—The hardening of acid and neutral fatty substances, by subjecting them to the action of sul-

phurous acid at elevated temperatures, either with or without pressure. Also, the use of oxide of copper, or its chemical substitutes, to remove from fat acids the sulphureted impurity produced therein, by treatment with sulphurous acid. Also, the methods of preserving the color of white neutral fats, when treated by sulphurous acid at elevated temperatures, by using the sulphurous acid entirely free from air or oxygen, and by using fats pure and neutral, and free from any mixture of acid, rancid, or decomposed fats.

116. Temples for Looms; Jeremiah C. Tilton, Sanbornton Bridge, New Hampshire.

Claim—The application of the cloth bearer carrier to its support by a hinge, arranged in manner substantially as described, that is, so as to allow the carrier and its bearer to be drawn backward under circumstances as described.

117. Corn Shellers; Artemas B. Vant and Arlon M. Cook, Milford, Massachusetts.

Claim—The combination and arrangement of the smooth revolving pressure plate or wheel, with the convex toothed wheel and guard plates, when constructed substantially in the manner described.

118. Hydrofuze Fabrics; James Wansborough, Southwark, County of Surrey, England, patented in England, December 13, 1853.

Claim—Securing the flocks, or other finely divided substance, after it has been sifted or spread on to the surface and calendered by applying to the surface thereof a solution of india rubber or allied gum. Also, in combination with the method of securing the flock described, the subjecting of the same to a steaming process.

119. Locomotive Engines; Ross Winans, Baltimore, Maryland.

Claim—The blast equalizing pipe proportioned to the chimney, and arranged substantially as set forth. Likewise, a blast pipe of less diameter than the smoke pipe, and having a bell mouth, in combination with an exhaust nozzle and the bottom on which the sparks lie.

120. Surveying Instrument; George Windle, Edenburgh, Virginia.

Claim—1st, Attaching the adjusting weight of the magnet case directly to the universal joint on which said case turns and swings. 2d, The arrangement of the pointer which designates the number of degrees at which the movable frame and telescope stand, adjusted on an adjusting screw, which has the surface of its head graduated so as to indicate minutes, in combination with a stationary pointer, and with an extension formed on the pointer, which comes opposite the degrees on the magnet case.

121. Steam Valves; John E. Wootten, Philadelphia, Pennsylvania.

Claim—The application of the anti-friction roller, in combination with a diaphragmatic piston, or an equivalent therefor.

122. Apparatus for Evaporating; Wm S. Worthington, Newton, New York.

Claim—The arrangement of a series of two or more grated fire-places, a b c, and communicating passages, f g, and flues h h, in a casing, c, on each or either side of a pan or train of pans,

123. Electro-magnetic Apparatus for Setting Water Engines in Motion; Moses G. Farmer, Salem, Assignor to Wm. F. Channing, Boston, Massachusetts.

Claim—1st, The combination of an electro-magnetic escapement with the cock or water valve, and with the detent of a water engine, separately or conjointly, for the purpose of controlling its motion from a distance, especially in its application to a fire alarm telegraph. 2d, The employment of two or more arms, of progressively increasing weight, in combination with a water engine, and with an electro-magnet, or its equivalent, for the purpose of releasing machinery, as set forth—the first of the weighted arms being liberated by the electro-magnet, while the last one of the series releases the machinery, each of the weighted arms being returned to its normal position by the action of the water engine.

124 Gas Burners; Wm. Wright, Assignor to self and Frederick Wright, City of New York,

Claim—A gas burner provided with a double flanched cup having openings, and otherwise constructed, substantially as described.

125. Automatic Grain Scales; Joseph R. Gates, Indianapolis, Assignor to self and Alexander Corey, Shelbyville, Indiana.

Claim—1st, The lever and spring, when used for the treble purpose of operating the cut-off gate, discharging or loosening the bottom valve, and preventing the weights from raising the scale-box and drawing the slide until the bottom is closed, thereby regulating the cut-off and flow of grain, without using the weight of the grain while the same is being weighted. 2d, The combination and arrangement of the spring and weight, m, with the elbow lever, k, connecting rod, j, and lever, i, when constructed as described.

126. Mode of Attaching Thills to Axles; George Kenny, Milford, Assignor to self and Josephus Baldwin, Nashua, New Hampshire.

Claim—The combination of the pressing and locking india rubber tube with the eyes and bolt, with its nut, substantially in the manner described.

127. Machine for Sawing Marble; James Lyon, Assignor to Jesse J. Davis, City of New York,

Claim—The arrangement of the reciprocating bar, adjustable rollers, adjustable frames, and diagonally slatted sides, in relation to each other, and to parts that connect with and guide the saws, for the purposes specified.

128. Manufacture of Emery Wheels and Sticks; Thomas J. Mayall, Roxbury, Assignor to self and George M. Davis, Boston, Massachusetts.

Claim.—The employment of vulcanized rubber tempered with olive oil, in combination with powdered emery, or its equivalent, for the manufacture of polishing wheels and sticks.

129. Elastic Draw-bar and Bumper; Thomas J. Mayall, Roxbury, Assignor to self and Benjamin F. Cook, Boston, Massachusetts.

Claim—The combined draw-bar and bumper, consisting of the elastic cylinder, the heads, bars, spring, and bolt, constructed as set forth.

130. Mowing Machines; Thomas Windell, Assignor to J. B. Ford, James W. Shield, and H. L. Bridewell, New Albany, Indiana.

Claim—1st, The employment, in connexion with a single frame piece of the box, which is cast in the manner specified, with axle, journal bearings, and flanches, in one piece, for the purpose of connecting and securing all the gearing necessary for the operation of the machine. 2d, The spring, secured at one end

to the front of the outer guard, and playing freely in the opening of the rear of said guard, in combination with the adjusting screw, whereby the convexity of the spring shoe is increased and diminished with the elevation or depression of the cutter.

131. Method of Enabling Moving Railroad Trains to Telegraph their own Passings at Certain Stations; Ernest Otto Pohl, Philadelphia, Pennsylvania.

Claim—The use of a self-acting electro-magnetic railway alarm telegraph, acting reliably of itself without the necessity of human intervention, and arranged and operating in the manner described.

132. Printing Presses; F. O. Degener, City of New York; ante-dated July 11, 1858.

Claim—Arranging or hanging an oscillating bed with an oscillating platen, in such manner that the motion of one will control the action of the other, so that by their forward movement they shall close and give an impression, and upon their reverse movement the form shall be inked, and the platen be brought into the proper position necessary for the reception of the sheet, and thus alternate from one of their positions to the other. Also, the arrangement of an oscillating bed and platen with the cam to cause the frisket to assume the desired position, so as to hold the sheet of paper while it is being conveyed from one position to the other.

133. Nursery Bottles; W. B. Potter, Boston, Massachusetts.

Claim—A nursing bottle of glass, having a metallic cap screwed upon it, and a metallic lacteal tube, when said cap is provided with a flanch for the reception of the elastic nipple.

134. Grinding Mills; Alfred Proseus, Philadelphia, Pennsylvania.

Claim—Placing across the recesses formed by the teeth of the shells, or of those of the burrs, or of both, of conical grinding mills, any convenient number of obstructing strips.

135. Machine for Dressing Hoops; Augustus Prenatt, Buffalo, New York.

Claim—Placing the cutters in the cutter head in such position that the plane of their cutting edge will cross their axis of motion at an angle of 45° (or nearly so), and also stand inclined to the horizontal plane of their axis at an angle of 45° (or nearly so). Also, the arrangement of the cutter in the vertically moving grate, including the adjustable roller, for the purpose of dressing the edge of the hoop, and for giving the hoop any required width, as described.

MECHANICS, PHYSICS, AND CHEMISTRY.

*Science as a Branch of Education.** By Professor Faraday, D.C.L., F.R.S.

[Abstract of a Lecture before the Royal Institution of Great Britain.]

The development of the applications of physical science in modern times has become so large and so essential to the well-being of man, that it may justly be used as illustrating the true character of pure science, as a department of knowledge, and the claims it may have for consideration by governments, universities, and all bodies to whom is confided the fostering care and direction of learning. As a branch of learning, men are beginning to recognise the claim of science to its own particular place; for, though flowing in channels utterly different in their course and end to those of literature, it conduces not less, as a means of instruction, to the discipline of the mind; whilst it ministers, more or less, to the wants, comforts, and proper pleasure, both mental and bodily, of every individual of every class in life. Until of late years, the education for, and recognition of, it by the bodies which may be considered as giving the general course of all education, have been chiefly directed to it only as it could serve professional services, —namely, those which are remunerated by society; but now the fitness of university degrees in science is under consideration, and many are taking a high view of it, as distinguished from literature, and think that it may be well studied for its own sake, *i. e.*, as a proper exercise of the human intelligence, able to bring into action and development all the powers of the mind. As a branch of learning, it has (without reference to its applications,) become as extensive and varied as literature; and it has this privilege, that it must ever go on increasing.

* From the London Mechanics' Magazine, July, 1858.

Thus it becomes a duty to foster, direct, and honor it, as literature is so guided and recognised; and the duty is the more imperative, as we find by the unguided progress of science and the experience it supplies, that, of those men who devote themselves to studious education, there are as many whose minds are constitutionally disposed to the studies supplied by it, as there are of others more fitted by inclination and power to pursue literature.

The value of the public recognition of science as a leading branch of education may be estimated in a very considerable degree by observation of the results of the education which it has obtained incidentally from those who, pursuing it, have educated themselves. Though men may be specially fitted by the nature of their minds for the attainment and advance of literature, science, or the fine arts, all these men, and all others, require first to be educated in that which is known in these respective mental paths; and, when they go beyond this preliminary teaching, they require a self-education directed (at least in science) to the highest reasoning power of the mind. Any part of pure science may be selected to show how much this private self-teaching has done, and by that to aid the present movement in favor of the recognition generally of scientific education in an equal degree with that which is literary, but perhaps electricity, as being the portion which has been left most to its own development, and has produced as its results the most enduring marks on the face of the globe, may be referred to. In 1800, Volta discovered the voltaic pile; giving a source and form of electricity before unknown. It was not an accident, but resulted from his own mental self-education: it was, at first, a feeble instrument, giving feeble results; but by the united mental exertions of other men, who educated themselves through the force of thought and experiment, it has been raised up to such a degree of power as to give us light, and heat, and magnetic and chemical action, in states more exalted than those supplied by any other means.

In 1819, Oersted discovered the magnetism of the electric current, and its relation to the magnetic needle; and, as an immediate consequence, other men, as Arago and Davy, instructing themselves by the partial laws and action of the bodies concerned, magnetized iron by the current. The results were so feeble at first as to be scarcely visible; but, by the exertion of self-taught men since then, they have been exalted so highly as to give us magnets of a force unimaginable in former times.

In 1831, the induction of electrical currents one by another, and the evolution of electricity from magnets, was observed,—at first in results so small and feeble that it required one much instructed in the pursuit to perceive and lay hold of them; but these feeble results, taken into the minds of men already partially educated and ever proceeding onwards in their self-education, have been so developed as to supply sources of electricity independent of the voltaic battery or the electric machine, yet having the power of both combined in a manner and degree which they neither separate nor together could ever have given it, and applicable to all the practical electrical purposes of life.

To consider all the departments of electricity fully, would be to lose the argument for its fitness in subserving education in the vastness of its extent; and it will be better to confine the attention to one application, as the electric telegraph, and even to one small part of that application, in the present case. Thoughts of an electric telegraph came over the minds of those who had been instructed in the nature of electricity, as soon as the conduction of that power with extreme swiftness through metals was known, and grew as the knowledge of that branch of science increased. The thought, as realized at the present day, includes a wonderful amount of study and development. As the end in view presented itself more and more distinctly, points at first apparently of no consequence to the knowledge of the science generally, rose into an importance which obtained for them the most careful culture and examination, and the almost exclusive exercise of minds whose powers of judgment and reasoning had been raised first by general education, and who, in addition, had acquired the special kind of education which the science in its previous state could give. Numerous and important as the points are which have been already recognised, others are continually coming into sight as the great development proceeds, and with a rapidity such as to make us believe that, much as there is known to us, the unknown far exceeds it, and that, extensive as is the teaching of method, facts, and law, which can be established at present, an education looking for far greater results should be favored and preserved.

The results already obtained are so large, as even in money value to be of very great importance;—as regards their higher influence upon the human mind, especially when that is considered in respect of cultivation, I trust they are, and ever will be, far greater. No intention exists here of comparing one telegraph with another, or of assigning their respective dates, merits, or special uses. Those of Mr. Wheatstone are selected for the visible illustration of a brief argument in favor of a large public recognition of scientific education, because he is a man both of science and practice, and was one of the very earliest in the field, and because certain large steps in the course of his telegraphic life will tell upon the general argument. Without referring to what he had done previously, it may be observed that in 1840 he took out patents for electric telegraphs which included, amongst other things, the use of the electricity from magnets at the communicator, —the dial face,—the step-by-step motion,—and the electro-magnet at the indicator. At the present time, 1858, he has taken out patents for instruments containing all these points; but these instruments are so altered and varied in character above the former, that an untaught person could not recognise them. The changes may be considered as the result of education upon the one mind which has been concerned with them, and are to me strong illustrations of the effects which general scientific education may be expected to produce.

In the first instruments powerful magnets were used, and keepers with heavy coils associated with them. When magnetic electricity was first discovored, the signs were feeble, and the mind of the student was

led to increase the results by increasing the force and size of the instruments. When the object was to obtain a current sufficient to give signals through long circuits, large apparatus were employed, but these involved the inconveniences of inertia and momentum; the keeper was not set in motion at once, nor instantly stopped; and, if connected directly with the reading indexes, these circumstances caused an occasional uncertainty of action. Prepared by its previous education, the mind could perceive the disadvantages of these influences, and could proceed to their removal; and now a small magnet is used to send sufficient currents through 12, 20, 50, a hundred, or several hundred miles; a keeper and helix is associated with it, which the hand can easily put in motion; and the currents are not sent out of the indicating instrument to tell their story until a key is depressed, and thus irregularity contingent upon first action is removed. A small magnet, ever ready for action and never wasting, can replace the voltaic battery; if powerful agencies be required, the electro-magnet can be employed without any change in principle or telegraphic practice; and, as magneto-electric currents have special advantages over voltaic currents, these are in every case retained. These advantages I consider as the results of scientific education, much of it not tutorial, but of self; but there is a special privilege about the science-branch of education, namely, that what is personal in the first instance immediately becomes an addition to the stock of scientific learning, and passes into the hands of the tutor, to be used by him in the education of others, and enable them in turn to educate themselves. How well may the young man entering upon his studies in electricity be taught by what is past to watch for the smallest signs of action, new or old; to nurse them up by any means until they have gained strength; then to study their laws, to eliminate the essential conditions from the non-essential, and at last to refine again, until the encumbering matter is as much as possible dismissed, and the power left in its highly developed and most exalted state.

The alterations or successions of currents produced by the movement of the keeper at the communicator pass along the wire to the indicator at a distance; there each one for itself confers a magnetic condition on a piece of soft iron, and renders it active or repulsive of small permanent magnets; and these, acting in turn on a propelment, cause the index to pass at will from one letter to another on the dial face. The first electro-magnets, *i. e.*, those made by the circulation of an electric current round a piece of soft iron, were weak; they were quickly strengthened, and it was only when they were strong that their laws and actions could be successfully investigated. But now they were required small, yet potential. Then came the teaching of Ohm's law; and it was only by patient study under such teaching that Wheatstone was able so to refine the little electro-magnets at the indicator, as that they should be small enough to consist with the fine work there employed, able to do their appointed work when excited in contrary directions by the brief currents flowing from the original common magnet, and unobjectionable in respect of any resistance they might offer to the transit of these tell-tale currents.

These small transitory electro-magnets attract and repel certain permanent magnetic needles, and the to-and-fro motion of the latter is communicated by a propelment to the index, being there converted into a step-by-step motion. Here everything is of the finest workmanship, the propelment itself requires to be watched by a lens, if its action is to be observed; the parts never leave hold of each other; the vibratory or rotary ratchet wheel and the fixed pallets are always touching; and thus allow of no detachment or loose shake; the holes of the axes are jeweled; the moving parts are most carefully balanced, a consequence of which is that agitation of the whole does not disturb the parts, and the telegraph works just as well when it is twisted about in the hands, or placed on board a ship or in a railway carriage, as when fixed immovably. When it is possible, as in the vibratory needle, the moving parts are brought near to the centre of motion, that the inertia of the portion to be moved, or the momentum of that to be stopped, should be as small as possible, and thus great quickness of indication obtained. All this delicacy of arrangement and workmanship is introduced advisedly; for the inventor, whom I may call the student here, considers that refined and perfect workmanship is more exact in its action, more unchangeable by time and use, and more enduring in its existence, than that which, being heavier, must be coarser in its workmanship, less regular in its action, and less fitted for the application of force by fine electric currents.

Now there was no accident in the course of these developments;—if there were experiments, they were directed by the previously acquired knowledge;—every part of the investigations was made and guided by the instructed mind. The results being such (and like illustrations might be drawn from other men's telegraphs, or from other departments of electrical science), then, if the term education may be understood in so large a sense as to include all that belongs to the improvement of the mind, either by the acquisition of the knowledge of others or by increase of it through its own exertions, we learn by them what is the kind of education science offers to man. It teaches us to be *neglectful* of nothing;—not to despise the small beginnings, for they precede of necessity all great things in the knowledge of science, either pure or applied. It teaches a continual comparison of the *small and great*, and that under differences almost approaching the infinite: for the small as often contains the great in principle as the great does the small; and thus the mind becomes comprehensive. It teaches to deduce principles carefully, to hold them firmly, or to suspend the judgment:—to discover and obey *law*, and by it to be bold in applying to the greatest what we know of the smallest. It teaches us first by tutors and books to learn that which is already known to others, and then by the light and methods which belong to science to learn for ourselves and for others;—so making a fruitful return to man in the future for that which we have obtained from the men of the past. Bacon, in his instruction, tells us that the scientific student ought not to be as the ant, who gathers merely; nor as the spider, who spins from her own bowels; but rather as the bee, who both gathers and produces.

All this is true of the teaching afforded by any part of physical science. Electricity is often called wonderful, beautiful; but it is so only in common with the other forces of nature. The beauty of electricity, or of any other force, is not that the power is mysterious and unexpected, touching every sense at unawares in turn, but that it is under *law*, and that the taught intellect can even now govern it largely. The human mind is placed above, not beneath it; and it is in such a point of view that the mental education afforded by science is rendered supereminent in dignity, in practical application, and utility; for, by enabling the mind to apply the natural power through law, it conveys the gifts of God to man.

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*Units of Work.**

The following are the results obtained in units of work or foot-pounds for one unit of heat by different authors.

	Centigrade thermometer. Foot-pounds.	Fahrenheit thermometer. Foot-pounds.
By Holtzman's formula, .	1227	682
By Joule's experiments, . .	1386	770
By Rankine's formula, .	1252	695
By Thompson's formula, . .	1390	772
For the best Cornish engine, by M. De Pambour,	148	82
For a perfect low-pressure condensing engine,	90·8	50·4
For an actual Boulton and Watt's engine,	46	25·5

Ransome's Process for Preserving Stone.† By R. Hunt.

The importance of the discovery of a process, which could be relied on, for the preservation of the stones employed in the erection of our public and other buildings, has long been felt; and many experiments have been made in the hope of attaining this object. In London, and in several of the large towns in the Provinces, we could point to buildings which have within a very few years exhibited the most unmistakable signs of decay. Lamina after lamina falls off, exposing a new surface to be freshly acted upon by the destroying agents; and thus, with comparative rapidity, the work of decay progresses; this has been referred to atmospheric causes, existing *now* as the result of our extensive manufactories and greatly increased population; but, to whatever cause the disintegration of the stone may be traced, certain it is, that scarcely any modern building, whether constructed of the coal measure sandstones, dolomites, oolites, or other well-known building stones, but exhibits, in a few years after its completion, lamentable evidences of decay.

Our attention has been directed to the Baptist Chapel built by Sir Morton Peto, in Bloomsbury. For some time past the Caen stone used in this structure has been crumbling, especially where it was exposed

* From the London Civ. Eng. and Arch. Jour., September, 1858.

† From the London Art Journal, October, 1858.

to the action of water. The disintegration was proceeding so rapidly that it became necessary to give immediate attention to it. It was determined that Mr. Frederick Ransome should make an experiment upon the towers, where the stone was in a worse condition than in any other part. The result of this experiment was so satisfactory that it was resolved that the entire building should be subjected to this process.

The most enduring stones in nature are those in which the cementing agent is *silica*—and it became a problem with the patentee, to produce a true *siliceous surface* upon any stones which appeared naturally liable to decay. All the sandstones are more or less porous, consequently they absorb water readily—this is one cause of their rapid disintegration. Availing himself of this, Mr. Ransome produces the desired result. First, the stone is made to absorb as much of a solution of the silicate of soda as possible; this being effected, it is washed with chloride of calcium. The play of chemical affinity is now brought into action *in the stone:* a double decomposition is effected, and insoluble silicate of lime fills the interstices; chloride of sodium (common salt) being formed, which is readily removed. It will be evident to all, that since every particle of the stone, to the depth penetrated by the solution, is surrounded by this silicate of soda, and that too—according to the law of surface action—in a concentrated form, that the silicate of lime which results from the action of the chloride on it, must completely fill the interstitial spaces, and thus render a stone, which was previously absorbent, absolutely non-absorbent.—(*Vide Art Journal*, Sept., 1857.

It will be found, that the stone surface of the Rev. W. Brock's chapel is now actually repellent of water, and that the hardness of the surface indicates a complete casing of the preservative silica. It should be distinctly understood that this process will not merely protect new stone from the influences of atmospheric action, but it stops decay in stones already exfoliating, and preserves them from future action.

Stones which have been in a state of rapid decomposition have been, for experiment, partially treated by this silicifying process. The result has been that the prepared parts have withstood the action of air, rain, and frost, showing no signs of injury, while the unprepared parts have completely broken up.

Beyond this, its preservative power, another advantage of the process is, that it can be applied to any stone without in the slightest degree affecting its color or grain: all the natural conditions are preserved, and the hardening superinduced.

Now that a well-known public building has been treated by this process, the result can be observed by every one. The *rationale* of the process alone—independently of the experiments which have been made—satisfies us that there is little chance of disintegration ensuing after the proper application of the solutions. We hope to watch the influences of heat and cold upon the surface of the Bloomsbury Baptist Chapel, and we will faithfully report the results of our examination to the readers of the *Art Journal.*

*Improvements in the Art of Engraving.** Patented in London, by WILLIAM HENRY FOX TALBOT, April 21, 1858.

In this invention I employ plates of steel, copper, or zinc, such as are commonly used by engravers. Before using a plate, its surface should be well cleaned. It should then be rubbed with a linen cloth dipped in a mixture of caustic soda, and whiting, in order to remove any remaining trace of greasiness. The plate is then to be rubbed dry with another linen cloth; this process is then to be repeated, after which the plate is, in general, sufficiently clean.

In order to engrave a plate I first cover it with a substance which is sensitive to light. This is prepared as follows:—About a quarter of an ounce of gelatine is dissolved in eight or ten ounces of water, by the aid of heat. To this solution is added about one ounce by measure, of a saturated solution of bichromate of potash in water, and the mixture is strained through a linen cloth. The best sort of gelatine for the purpose is that used by cooks and confectioners, and commonly sold under the name of gelatine. In default of this, isinglass may be used, but it does not answer so well. Some specimens of isinglass have an acidity which slightly corrodes and injures the metal plates. If this accident occurs, ammonia should be added to the mixture, which will be found to correct it. This mixture of gelatine and bichromate of potash keeps good for several months, owing to the antiseptic and preserving power of the bichromate. It remains liquid and ready for use at any time during the summer months, but in cold weather it becomes a jelly, and has to be warmed before using it. It should be kept in a cupboard or dark place. The proportions given above are convenient, but they may be considerably varied without injuring the result. The engraving process should be carried on in a partially darkened room, and is performed as follows:—

A little of this prepared gelatine is poured on the plate to be engraved, which is then held vertical, and the superfluous liquid allowed to drain off at one of the corners of the plate; it is then held in a horizontal position over a spirit lamp, which soon dries the gelatine, which is left as a thin film of a pale yellow color covering the metallic surface, and generally bordered with several narrow bands of prismatic colors. These colors are of use to the operator, by enabling him to judge of the thinness of the film. When it is very thin the prismatic colors are seen over the whole surface of the plate. Such plates often make excellent engravings; nevertheless, it is perhaps safer to use gelatine films which are a little thicker. Experience alone can guide the operator to the best result. The object to be engraved is then laid on the metal plate and screwed down upon it in a photographic copying frame. Such objects may be either material substances, as lace, the leaves of plants, &c., or they may be engravings, or writings, or photographs, &c., &c.

* From the Repertory of Patent Inventions, Nov. 1858.

The plate bearing the object upon it is then to be placed in the sunshine for a space of time, varying from one to several minutes, according to circumstances. Or else it may be placed in common daylight, but of course for a longer time. As in other photographic processes, the judgment of the operator is here called into play, and his experience guides him as to the proper time of exposure to the light. When the frame is withdrawn from the light, and the object removed from the plate, a faint image is seen upon it, the yellow color of the gelatine having turned brown wherever the light has acted. This process, so far as I have yet described it, is in all essential respects identical with that which I described in the specification of my former patent for improvements in engraving, bearing date the 29th of October, 1852.

The novelty of the present invention consists in the improved method by which the photographic image obtained in the manner above described is engraved upon the metal plate. The first of these improvements is as follows:—I formerly supposed that it was necessary to wash the plate bearing the photographic image in water, or in a mixture of water and alcohol, which dissolves only those portions of the gelatine on which the light has not acted. And I believe that all other persons who have employed this method of engraving by means of gelatine and bichromate of potash have followed the same method, viz: that of washing the photographic image. But, however carefully this process is conducted, it is frequently found when the plate is again dry that a slight disturbance of the image has occurred, which of course is injurious to the beauty of the result. And I have now ascertained that it is not at all necessary to wash the photographic image. On the contrary, much more beautiful engravings are obtained upon plates which have not been washed, because the more delicate lines and details of the picture have not been disturbed. The process which I now employ is as follows:—When the plate bearing the photographic image is removed from the copying frame, I spread over its surface carefully and very evenly a little finely-powdered gum copal (in default of which common resin may be employed). It is much easier to spread this resinous powder evenly upon the surface of the gelatine than it is to do so upon the naked surface of a metal plate. The chief error the operator has to guard against is that of putting on too much of the powder; the best results are obtained by using a very thin layer of it, provided it is uniformly distributed. If too much of the powder is laid on, it impedes the action of the etching liquid. When the plate has been thus very thinly powdered with copal it is held horizontally over a spirit lamp in order to melt the copal. This requires a considerable heat. It might be supposed that this heating of the plate, after the formation of a delicate photographic image upon it, would disturb and injure that image, but it has no such effect. The melting of the copal is known by its change of color. The plate should then be withdrawn from the lamp and suffered to cool. This process may be called the laying on aquatint ground upon the gelatine, and I believe it to be a new process. In the common mode of laying on an aquatint ground, the resinous particles are laid upon the naked surface of the metal before the en-

graving is commenced. The gelatine being thus covered with a layer of copal disseminated uniformly and in minute particles, the etching liquid is to be poured on. This is prepared as follows:—Muriatic acid, otherwise called hydrochloric acid, is saturated with peroxide of iron, as much as it will dissolve with the aid of heat. After straining the solution to remove impurities, it is evaporated till it is considerably reduced in volume, and is then poured off into bottles of a convenient capacity. As it cools it solidifies into a brown semi-crystalline mass. The bottles are then well corked up and kept for use.

I shall call this preparation of iron by the name of per-chloride of iron in the present specification, as I believe it to be identical with the substance described by chemical authors under that name. For example, see "Turner's Chemistry," 5th edition, page 537; and by others called permuriate of iron. For example, see "Brande's Manual of Chemistry," 2d edition, vol. ii, page 117.

It is a substance very attractive of moisture. When a little of it is taken from a bottle in the form of a dry powder and laid upon a plate it quickly deliquesces, absorbing the atmospheric moisture. In solution in water it forms a yellow liquid in small thicknesses, but chesnut-brown in greater thicknesses. In order to render its mode of action in photographic engraving more intelligible, I will first state that it can be very usefully employed in common etching; that is to say, that if a plate of copper, steel, or zinc is covered with an etching ground and lines are traced on it with a needle's point, so as to form any artistic subject, then, if the solution of perchloride of iron is poured upon the plate it quickly effects an etching, and does this without disengaging bubbles of gas, or causing any smell, for which reason it is much more convenient to use than aquafortis, and also because it does not injure the operator's hands or his clothes, if spilt upon them.

It may be employed of various strengths for common etching, but requires peculiar management for photoglyphic engraving. And as the success of that mode of engraving chiefly turns upon this point, it should be well attended to.

Water dissolves an extraordinary quantity of perchloride of iron, sometimes evolving much heat during the solution. I find that the following is a convenient way of proceeding:—A bottle, No. 1, is filled with a saturated solution of perchloride of iron in water.

A bottle, No. 2, with a mixture consisting of five or six parts of the saturated solution, and one part of water.

And a bottle, No. 3, with a weaker liquid, consisting of equal parts of water and of the saturated solution. Before attempting an engraving of importance it is almost essential to make preliminary trials, in order to ascertain that these liquids are of the proper strengths. These trials I shall therefore now proceed to point out. I have already explained how the photographic image is made on the surface of the gelatine and covered with a thin layer of powdered copal or resin, which is then melted by holding the plate over a lamp. When the plate has become perfectly cold it is ready for the etching process, which is performed as follows:—A small quantity of the solution in bottle No. 2, namely,

that consisting of five or six parts saturated solution to one of water, is poured upon the plate and spread with a camel-hair brush evenly all over it. It is not necessary to make a wall of wax round the plate, because the quantity of liquid employed is so small, that it has no tendency to run off the plate. The liquid penetrates the gelatine wherever the light has not acted on it, but it refuses to penetrate those parts upon which the light has sufficiently acted. It is upon this remarkable fact that the art of photoglyphic engraving is mainly founded. In about a minute the etching is seen to begin, which is known by the parts etched turning dark-brown or black, and then it spreads over the whole plate, the details of the picture appearing with great rapidity in every quarter of it. It is not desirable that this rapidity should be too great, for in that case it is necessary to stop the process before the etching has acquired sufficient depth (which requires an action of some minutes duration). If, therefore, the etching on trial is found to proceed too rapidly, the strength of the liquid in bottle No. 2 must be altered (by adding some of the saturated solution to it) before it is employed for another engraving. But if, on the contrary, the etching fails to occur after the lapse of some minutes, or if it begins, but proceeds too slowly, this is a sign that the liquid in bottle No. 2 is too strong, and too nearly approaching saturation. To correct this, a little water must be added to it before it is employed for another engraving. But in doing this the operator must take notice that a very minute quantity of water, added often, makes a great difference and causes the liquid to etch very rapidly. He will, therefore, be careful in adding water not to do so too freely. When the proper strength of the solution in bottle No. 2 has just been adjusted, which generally requires three or four experimental trials, it can be employed with security. Supposing, then, that it has been ascertained to be of the right strength, the etching is commenced as above mentioned, and proceeds till all the details of the picture have become visible, and present a satisfactory appearance to the eye of the operator, which generally occurs in two or three minutes; the operator stirring the liquid all the time with a camel-hair brush, and thus slightly rubbing the surface of the gelatine, which has a good effect. When it seems likely that the etching will improve no farther, it must be stopped. This is done by wiping off the liquid with cotton wool, and then rapidly pouring a stream of cold water over the plate, which carries off all the remainder of it. The plate is then wiped with a clean linen cloth, and then rubbed with soft whiting and water to remove the gelatine. The etching is then found to be completed.

I will now describe another etching process very slightly differing from the former, which I often use. When the plate is ready for etching, pour upon it a small quantity of the liquid No. 1 (the saturated solution). This should be allowed to rest upon the plate one or two minutes. It has no very apparent effect, but it acts usefully in hardening the gelatine. It is then poured off from the plate, and a sufficient quantity of solution No. 2 is poured on. This effects the etching in the manner before described; and if this appears to be quite satisfactory,

nothing further is required to be done. But it often happens that certain faint portions of the engraving, such as distant mountains or buildings in a landscape, refuse to appear, and as the engraving would be imperfect without them I recommend the operator in that case to take some of the weak liquid No. 3 in a little saucer, and without pouring off the liquid No. 2, which is etching the picture, to touch with a camel-hair brush, dipped in liquid No. 3, those points of the picture where he wishes for an increased effect. This simple process often causes the wished-for details to appear, and that sometimes with great rapidity, so that caution is required in the operator in using this weak solution, No. 3, especially lest the etching liquid should penetrate to the parts which ought to remain white. But in skilful hands, its employment cannot fail to be advantageous, for it brings out soft and faint shadings, which improve the engraving, and which would otherwise probably be lost. Experience is requisite in this as in most other delicate operations connected with photography; but I have endeavored clearly to explain the leading principles of this new process of engraving according to the mode which I have hitherto found the most successful.

With respect to the second invention mentioned in my provisional specification, in which the electrotype process is employed, I have found that it gives less successful results than that which I have fully described above, and I have therefore omitted it from this specification, and make no claim with respect to it.

In conclusion I would remark, that besides the process of photographic engraving considered as a whole being new, I believe the following points also to be new, viz:—

First, the etching a photographic image formed upon a surface of gelatine and bichromate of potash, without first disturbing that surface by washing it with water or alcohol.

Second, the laying an aquatint ground of resin or copal upon a surface of gelatine, and not, as usual, upon the naked metallic surface of the plate.

Third, after forming a photographic image on gelatine, the heating it strongly over a spirit-lamp or otherwise.

Fourth, the use and employment of perchloride of iron as an etching liquid for the production of photographic engravings.

Fifth, the use and employment of the same as a substitute for aquafortis in common etching.

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*Chemical Matches without Phosphorus or other Poison.**

By M. Canouil.

The new matches are absolutely without white or red phosphorus, ordinary or amorphous. They cannot be used as a poison, and when reduced to their least degree of inflammability give rise to no danger of fire. They are formed essentially of chlorate of potash, mixed with a small quantity of a metallic peroxide, bichromate, or oxysulphuret,

* From the London Chemical Gazette, No. 388.

a small quantity of a metallic peroxide, bichromate, or oxysulphuret, when it is desired to render them more inflammable. The author has found means to triturate the chlorate of potash, even when dry, without danger of explosion.

The new matches diffuse no odor, either in the manufacture or in use; they light without explosion or projection.—*Comptes Rendus*, June 28, 1858, p. 1268.

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*On the Hardness of Metals and Alloys.** By F. CRACE CALVERT, M.R.A., of Turin, F.C.S., &c.; and RICHARD JOHNSON, F.C.S., &c.

[Read before the Literary and Philosophical Society of Manchester.]

The process at present adopted for determining the comparative degree of hardness of bodies, consists in rubbing one body against another, and that which indents or scratches the other is admitted to be the harder of the two bodies experimented upon. Thus, for example:

Diamond,	Quartz,	Iron,	Tin,
Topaz,	Steel,	Copper,	Lead.

This method is not only very unsatisfactory in its results, but it is also inapplicable for determining with precision the various degrees of hardness of the different metals and their alloys. We therefore thought that it would be useful and interesting if we were to adopt a process which would enable us to represent by numbers the comparative degrees of hardness of various metals and their alloys.

To carry out these views we devised the following apparatus and method of operating. The machine used is on the principle of a lever, with this important modification, that the piece of metal experimented upon can be relieved from the pressure of the weight employed without removing the weight from the end of the longer arm of the lever. The machine consists of a lever, with a counterpoise and a plate, on which the weights are gradually placed; the fulcrum bears on a square bar of iron, passing through supports. The bar is graduated, and has at its end a conical steel point, 7 *mm.* or 0·275 of an inch long, 5 *mm.* or 0·197 of an inch wide at the base, and 1·25 *mm.* or 0·049 of an inch wide at the point which bears on the piece of metal to be experimented on, and this is supported on a solid piece of iron. The support, or point of resistance, is lowered or raised by a screw, and when, therefore, this screw is turned, the whole of the weight on the lever is borne by the support and the screw. When it is necessary, by turning the screw, the weight on the lever is re-established on the bar, and experimented upon.

When we wished to determine the degree of hardness of a substance, we placed it on the plate, and rested the point upon it, noticing the exact mark on the bar, and then gradually added weights on the end of the lever until the steel point entered 3·5 *mm.* or 0·128 of an inch during half an hour, and then read off the weight. A result was never accepted without at least two experiments being made, which corresponded so far as to present a difference of only a few pounds. The

*From the Journal of the Society of Arts, No 314.

following table gives the relative degree of hardness of some of the more common metals. We specially confine our researches to this class, wishing the results to be practically useful to engineers and others who have to employ metals, and often require to know the comparative hardness of metals and alloys.

Names of Metals.	Weight employed.	Calculated Cast Iron = 1000.
Staffordshire Cold Blast Cast Iron —Grey, No. 3,	4800 lbs.	1000
Steel,	4600?	958?
Wrought Iron,*	4550	948
Platinum,	1800	375
Copper—pure,	1445	301
Aluminium,	1300	271
Silver—pure,	1000	208
Zinc "	880	183
Gold "	800	167
Cadmium "	520	108
Bismuth "	250	52
Tin "	130	27
Lead "	75	16

* This wrought iron was made from the above mentioned cast iron.

This table exhibits a curious fact, viz: the high degree of hardness of cast iron as compared with that of all other metals, and although we found alloys which possessed an extraordinary degree of hardness, still none were equal to cast iron.

The first series of alloys we shall give, is that of copper and zinc.

Formulæ of Alloys and per centages.		Weight Employed.	Obtained Cast Iron = 1000.	Calculated* Cast Iron = 1000.
$Zn\,Cu_5$	Cu 82·95, Zn 17·05	2050 lbs.	427·08	280·83
$Zn\,Cu_4$	Cu 79·56, Zn 20·44	2250	468·75	276·82
$Zn\,Cu_3$	Cu 74·48, Zn 25·52	2250	468·75	276·04
$Zn\,Cu_2$	Cu 66·06, Zn 33·94	2270	472·92	261·04
$Zn\,Cu$	Cu 49·32, Zn 50·68	2900	604·17	243·33
$Cu\,Zn_2$	Cu 32·74, Zn 67·26	Broke with 1500 lbs. without the point entering.		
$Cu\,Zn_3$	Cu 24·64, Zn 75·36	Broke with 1500 lbs. with an impression ½ *mm.* deep.		
$Cu\,Zn_4$	Cu 19·57, Zn 80·43	Entered a little more than the above; broke with 2000 lbs.		
$Cu\,Zn_5$	Cu 16·30, Zn 83·70	Entered 2 *mm.* with 1500 lbs.; broke with 1700 lbs.		

* To calculate the hardness of an alloy, we multiplied the per centage quantity of each metal by the respective hardness of that metal, added the two results together, and divided by 100. The quotient is the theoretical hardness.

These results show that all the alloys containing an excess of copper are much harder than the metals composing them, and, what is

not less interesting, that the increased degree of hardness is due to the zinc, the softer metal of the two which compose these alloys. The quantity of this metal must, however, not exceed 50 ⅌ cent. of the alloy, or the alloy becomes so brittle that it breaks as the steel point penetrates. We believe that some of these alloys, with an excess of zinc, and which are not found in commerce owing to their white appearance, deserve the attention of engineers. There is in this series an alloy to which we wish to draw special attention, viz: the alloy Cu Zn, composed in 100 parts of

Copper, . .	49·32
Zinc, . .	50·68
	100·00

Although this alloy contains about 20 ⅌ cent. more zinc than any of the brasses of commerce, still it is, when carefully prepared, far richer in color than the ordinary alloys of commerce. The only reason that we can give why it has not been introduced into the market is, that when the amount of zinc employed exceeds 33 ⅌ cent., the brass produced becomes so white that the manufacturers have deemed it advisable not to exceed that proportion. If, however, they had increased the quantity to exactly 50·68 ⅌ cent., and mixed the metals well, they would have obtained an alloy as rich in color as if it had contained 90 ⅌ cent. of copper, and of a hardness three times as great as that given by calculation. In order to enable engineers to form an opinion as to the value of this cheap alloy, we give them the degrees of hardness of several commercial brasses:—

Commercial Brasses.		Weight employed.	Cast Iron = 1000.	
			Obtained.	Calculated.
"Large Bearing,"	Copper, 82·05 *Tin, 12·82 Zinc, 5·13	lbs. 2700	562	259
"Mud Plugs,"	Copper, 80·00 *Tin, 10·00 Zinc, 10·00	3600	750	262
"Yellow Brass,"	Copper, 64·00 Zinc, 36·00	2500	520	258
"Pumps & Pipes,"	Copper, 80·00 *Tin, 5·00 Zinc, 7·50 Lead, 7·50	1650	343	257

* These alloys all contain tin.

The alloy Cu Zn possesses another remarkable property, viz: the facility with which it is capable of cystallizing in prisms half an inch in length, of extreme flexibility. There is no doubt that this alloy is a definite chemical compound, and not a mixture of metals, as alloys are generally considered to be. Our researches on the conductibility of heat by alloys, recently presented to the Royal Society, leave no doubt that many alloys are definite chemical compounds.

On Bronze Alloys.

Formulæ of Alloys and percentages.	Weight employed.	Obtained Cast Iron = 1000.	Calculated Cast Iron = 1000.
$Cu\ Sn_5$ { Cu 9·73, Sn 90·27 }	400 lbs.	88·33	51·67
$Cu\ Sn_4$ { Cu 11·86, Sn 88·14 }	460	95·81	59·56
$Cu\ Sn_3$ { Cu 15·21, Sn 84·79 }	500	104·17	68·75
$Cu\ Sn_2$ { Cu 21·21, Sn 78·79 }	650	135·42	84·79
$Cu\ Sn$ { Cu 34·98, Sn 65·02 }	At 700 lbs. the point entered one-half and the alloy broke.		
$Sn\ Cu_2$ { Cu 48·17, Sn 51·83 }	At 800 lbs. the alloy broke without the point entering.		
$Sn\ Cu_3$ { Cu 61·79, Sn 38·21 }	At 800 lbs. the alloy broke in small pieces (blue alloy).		
$Sn\ Cu_4$ { Cu 68·27, Sn 31·73 }	At 1300 lbs. divided the alloy in two, point not entering 1 *mm.*		
$Sn\ Cu_5$ { Cu 72·90, Sn 27·10 }	The same as the preceding.		
$Sn\ Cu_{10}$ { Cu 84·32, Sn 15·68 }	4400	916·66	257·08
$Sn\ Cu_{15}$ { Cu 88·97, Sn 11·03 }	3710	772·92	270·83
$Sn\ Cu_{20}$ { Cu 91·49, Sn 8·51 }	3070	639·58	277·70
$Sn\ Cu_{25}$ { Cu 93·17, Sn 6·83 }	2890	602·08	279·16

The results obtained from this series of alloys lead to several conclusions deserving our notice. First, the marked softness of all the alloys containing an excess of tin; secondly, the extraordinary fact that an increased quantity of so malleable a metal as copper, should so suddenly render the alloy brittle, for the

Alloy $Cu\ Sn_2$, or

$$\left.\begin{array}{ll}\text{Copper,} & 21{\cdot}21\\ \text{Tin,} & 78{\cdot}79\end{array}\right\}\text{is not brittle.}$$

whilst the alloy Cu Sn, or

$$\left.\begin{array}{ll}\text{Copper,} & 34{\cdot}98\\ \text{Tin,} & 65{\cdot}02\end{array}\right\}\text{is brittle.}$$

Therefore the addition of 14 ℔ cent. of copper renders a bronze alloy brittle. This curious fact is observed in all the alloys with excess of copper, $Sn\ Cu_2$, $Sn\ Cu_3$, $Sn\ Cu_4$, $Sn\ Cu_5$, until we arrive at one containing a great excess of copper, viz: the alloy $Sn\ Cu_{10}$, consisting of copper 84·68 and tin 15·32, when the brittleness ceases; but, strange to say, this alloy, which contains four-fifths of its weight of copper, is, notwithstanding, nearly as hard as iron. This remarkable influence of copper in the bronze alloys is also visible in those composed of

$Sn\ Cu_{15}$, containing 88·97 of copper.
$Sn\ Cu_{20}$, " 91·49 "
$Sn\ Cu_{25}$, " 93 17 "

Copper acquires such an increased degree of hardness by being alloyed

with tin or zinc, that we thought it interesting to ascertain if alloys composed of these two metals would also have a greater degree of hardness than that indicated by theory; we accordingly had a series of alloys prepared in equivalent quantities, and these are the results arrived at:—

Formulæ of Alloys and per centages of each.		Weight employed.	Obtained Cast Iron = 1000.	Calculated Cast Iron = 1000.
Zn Sn_2	Zn 21·65, Sn 78·35	300 lbs.	64·50	60·83
Zn Sn	Zn 35·60, Sn 64·40	330	68·75	82·70
Sn Zn_2	Sn 47·49, Zn 52·51	400	83·33	110·00
Sn Zn_3	Sn 37·57, Zn 62·43	450	93·70	124·58
Sn Zn_4	Sn 31·14, Zn 68·86	505	105·20	131·22
Sn Zn_5	Sn 26·57, Zn 73·43	600	125·00	142·08
Sn Zn_{10}	Sn 15·32, Zn 84·68	580	120·33	158·33

These results show that these metals exert no action on each other, as the numbers indicating the degrees of hardness of their alloys are rather less than those required by theory. Our researches on the conductibility of heat by the three above series of alloys throw, we believe, some light on the great difference which the alloys of bronze present as compared with those of tin and zinc; for we have stated above that the latter conduct heat as a mixture of metals would do, and not as the former series, which conduct heat as definite chemical compounds.

We shall conclude by giving the degrees of hardness of two other series of alloys, viz: those composed of lead and antimony, and lead and tin. In the series of lead and tin we find that tin also increases the hardness of lead, but not in the same degree as it does that of copper.

Lead and Antimony.

Formulæ of Alloys and percentages.		Weight employed.	
Pb Sb_5	Pb 24·31, Sb 75·69	lbs.	Entered 2·5 *mm.* with 800 lbs.; then broke.
Pb Sb_4	Pb 28·64, Sb 71·36		Entered 2·7 *mm.* with 800 lbs.; broke with 900 lbs.
Pb Sb_3	Pb 34·86, Sb 65·14	875	
Pb Sb_2	Pb 44·53, Sb 55·47		Entered 2·5 *mm.* with 500 lbs.; broke with 600 lbs.
Pb Sb	Pb 61·61, Sb 38·39	500	
Sb Pb_2	Pb 76·32, Sb 23·68	385	
Sb Pb_3	Pb 82·80, Sb 17·20	310	
Sb Pb_4	Pb 86·52, Sb 13·48	300	
Sb Pb_5	Pb 88·92, Sb 11·08	295	

Lead and Tin.

Formulæ of Alloys and percentages.		Weight employed.	Obtained Cast Iron = 1000.	Calculated Cast Iron = 1000.
$PbSn_5$	Pb 26 03, Sn 73·97	200 lbs.	41·67	23·96
$PbSn_4$	Pb 30·57, Sn 69·43	105	40 62	23·58
$PbSn_3$	Pb 36·99, Sn 63·01	160	32·33	22·83
$PbSn_2$	Pb 46·82, Sn 53·18	125	26·04	20·09
$PbSn$	Pb 63·78, Sn 36·22	100	20·83	19·77
$SnPb_2$	Pb 77·89, Sn 22·11	125	26·04	18·12
$SnPb_3$	Pb 84·09, Sn 15·91	135	28·12	17·23
$SnPb_4$	Pb 87·57, Sn 12 43	125	26·04	17 08
$SnPb_5$	Pb 89·80, Sn 10·20	110	22·92	16·77

We have great pleasure in thanking here, Mr. Siméon Stoikowitsch, F.C.S., for his valuable assistance during these long researches.

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*On a method of rendering Engraved Copperplates capable of producing a greatly-increased Number of Impressions.** By F. Joubert.

Under the circumstances which I have described, it had become a desideratum to harden, if possible, the surface of a copperplate, and to protect it from wear while printing, but it is only lately that this important object has been attained.

In March last, my friend, M. Jacquin, of Paris, took out a patent in this country for a method of coating plates with iron, which had already been successfully applied in France, and of which the merit is due to my friend, M. Henri Garnier, of Paris.

I have myself had the advantage of co-operating with M. Garnier in the development of the invention, the principles of which I shall now proceed to describe:—

If the two wires of a galvanic battery be plunged separately into a solution of iron, having ammonia for its basis, the wire of the positive pole is immediately acted upon, while that of the negative pole receives a deposit of the metal of the solution—this is the principle of the process which we have named "acierage."

The operation takes place in this way:—By placing at the positive pole a plate or sheet of iron, and immersing it in a proper iron solution, the metal will be dissolved under the action of the battery, and will form hydrochlorate of iron, which, being combined with the hydro-

* From the Journal of the Society of Arts, No. 311.

chlorate of ammonia of the solution, will become a bichloride of ammonia and iron; if a copper plate be placed at the opposite pole and likewise immersed, the solution being properly saturated, a deposit of iron, bright and perfectly smooth, is thrown upon the copperplate, from this principle:—

Water being composed of hydrogen and oxygen.

Sal ammoniac being composed of

1st. Hydrochloric acid containing chlorine and hydrogen.

2d. Ammonia, containing hydrogen, nitrogen, and oxygen.

The water is decomposed under the galvanic action, and the oxygen fixes itself on the iron plate, forming an oxide of iron; the hydrochloric acid of the solution acting upon this oxide forms a hydrochlorate of iron, whilst the hydrogen precipitates itself upon the plate of the negative pole, and, unable to combine with it, comes up to the surface of the solution in bubbles.

My invention has for its object certain means of preparing printing surfaces, whether for intaglio or surface printing, so as to give them the property of yielding a considerably greater number of impressions than they are capable of doing in their ordinary or natural state. And the invention consists in covering the printing surfaces, whether intaglio or relief, and whether of copper or other soft metal, with a very thin and uniform coating of iron, by means of electro-metallurgical processes. The invention is applicable whether the device to be printed from be produced by engraving by hand, or by machinery, or by chemical means, and whether the surface printed from be the original or an electrotype surface produced therefrom. I would remark that I am aware that it has been before proposed to coat type and stereotypes with a coating of copper, to enable their surfaces to print a larger number of impressions than they otherwise would do; I therefore lay no claim to the general application of a coating of harder metal on to the surface of a softer one, but my claim to invention is confined to the application of a coating of iron by means of electricity on to copper and other metallic printing surfaces.

In carrying out the invention the solutions of iron employed may be varied, and such is the case in respect to the arrangement of the galvanic battery or other source of the electric currents used; I do not therefore limit the invention to the means hereinafter described, but I believe they will be found to be the best for the purpose.

I would further remark that it is important that a ferric solution should be employed which will not dissolve or corrode the plate intended to be coated, for if it be attempted to use such a solution, though the iron will be precipitated, it will not only be in a non-coherent state, but the engraved surface itself will be liable to be attacked and injured. It may also be remarked that the coating of iron admits of being removed from a printing surface of copper without injury to the original plate, hence the original plate may, after being coated and used for some time, have the worn coating removed, and then be recovered with an iron coating as often as may be required; and if care is taken to remove the coating of iron before it has been entirely worn

away, the engraved copper or other plate may be made to print a vast number of impressions and yet remain in the original state it was in when it left the hands of the engraver, or was otherwise first produced; the only limit appears to be in the gradual change which takes place in the body of the printing surface by the compression to which it is subjected in the process of printing. Heretofore, in respect to plates engraved in intaglio, if of steel, they each yield on the average about 3000 impressions without re-touching; if of copper, they each yield on an average not more than 800 without re-touching; whilst electro casts of copper obtained from the originals will not on an average each yield even 200 impressions without re-touching; in fact such printing surfaces are so easily worn, that after the first 100 or 150 impressions, there is a considerable deterioration in the quality of the work produced. Therefore, for the supply of the number of impressions often required by art associations and others, it has been found necessary to multiply the electro casts very considerably. In such cases the invention is applicable with considerable advantage, for I find that an electro plate 40×22 inches, covered or coated with iron, has yielded 2000 impressions without its being necessary to remove and renew the iron coating, there being no perceptible difference between the first and last impression, the work on the plate appearing not to have suffered in the slightest degree. Hence, in future, by the application of the invention, it will only be necessary to multiply electro casts to such an extent as may be necessary to ensure the production of prints or impressions with the requisite speed on paper, calico, or other fabrics. At the same time an original engraving on copper would become, when treated according to the invention, more lasting than if engraved on steel. Although original surfaces engraved in relief, and also electro and other casts taken from them, yield a considerably greater number of impressions than those I have mentioned as obtained from plates engraved in intaglio, to which the invention has not been applied, nevertheless, the invention is applicable with great advantage to such relief printing surfaces, whether of copper or other soft metal, for if they be coated with iron according to the invention, they will yield almost an indefinite number of impressions, provided the iron surface be renewed as often as may be necessary, and the printing surfaces be again recoated.

In carrying out the invention, I prefer to use that modification of Grove's battery known as Bunsen's, and I do so because it is desirable to have what is called an intensity arrangement. The trough I use for containing the solution of iron in which the engraved printing surface is to be immersed in order to be coated is lined with gutta percha, and it is 45 inches long, 22 inches wide, and 32 inches deep. In proceeding to prepare for work, the trough, whether of the size abovementioned or otherwise, is filled with water in combination with hydrochlorate of ammonia (sal ammoniac) in the proportion of 1000 lbs. by weight of water, to 100 lbs. of hydrochlorate of ammonia. A plate of sheet iron, nearly as long and as deep as the trough, is attached to the positive pole of the battery, and immersed in the solution. Another

plate of sheet iron, about half the size of the other, is attached to the negative pole of the battery, and immersed in the solution, and when the solution has arrived at the proper condition, which will require several days, the plate of iron attached to the negative pole is removed, and the printing surface to be coated is attached to such pole, and then immersed in the bath till the required coating of iron is obtained thereto. If, on immersing the copperplate in the solution, it be not immediately coated with a bright coating of iron all over, the bath is not in a proper condition, and the copperplate is to be removed and the iron plate attached and returned into the solution. The time occupied in obtaining a proper coating of iron to a printing surface varies from a variety of causes, but a workman after some experience, and by careful attention, will readily know when to remove the plate from the solution; and it is desirable to state that a copperplate should not be allowed to remain in the bath and attached to the negative pole of the battery after the bright coating of iron begins to show a blackish appearance at the edges. Immediately on taking a copperplate from the bath great care is to be observed in washing off the solution from all parts, and this I believe may be most conveniently done by causing jets of water forcibly to strike against all parts of the surface. The plate is then dried and washed with spirits of turpentine, when it is ready for being printed from in the ordinary manner.

If an engraved copperplate be prepared by this process, instead of a comparatively limited number of impressions being obtained and the plate wearing out gradually, a very large number can be printed off without any sign of wear in the plate, the iron coating protecting it effectually; the operation of coating can be repeated as many times as required, so that an almost unlimited number of impressions can be obtained from one plate, and that a copper one.

This process will be found extremely valuable for electrotype plates and also for photogalvanic plates, since they can be so protected as to acquire the durability of steel, and more so, for a steel plate will require repairing from time to time, these will not, but simply re-coating whenever it is found necessary; by these means one electro copperplate has yielded more than 12,000 impressions, and was found quite unimpaired when examined minutely.

It is easy to appreciate the importance of this invention as applied to artistic or line engraving more especially, for a copperplate being once engraved, if submitted to the acierage process, will become a lasting property, not liable to deterioration by printing, and the public may expect to be supplied with the very best impressions at a more moderate charge, whilst to the numerous branches of commercial engraving, for the ceramic manufactures and others, as well as to the vast number of old engraved copperplates existing in this country, this process is likely to confer an immense additional value.

I need not say that copper is not by no means the only metal to which the process is applicable, for the same principle will be found to answer in the case of other soft metals used for printing purposes, and I shall only add, in conclusion, that although the principle of electro-

typing has been applied up to the present date in a variety of ways since it was organized by Thomas Spencer, in 1837, this is, I believe, the first time that an attempt has been successfully made to prepare an engraved copperplate with harder metal, with the view of increasing its printing capabilities, and I feel happy to have been the first to introduce so valuable a discovery into this, my adopted country.

For the Journal of the Franklin Institute.

Particulars of the Steamer Albatross.

Hull built by George Greenman & Co., Mystic Bridge, Connecticut. Machinery by the Corliss Steam Engine Company, Providence, R. I. Owners, Commercial Steamboat Company.

HULL.—			
Length on deck,		158 feet.	
Breadth of beam, (molded,)		30 "	
Depth of hold,		10 "	
" to spar deck,		10 "	
Frames, *molded*,			13 inches.
" *sided*,			10 & 12 "
" apart at centres,			26 "
Depth of keel,			14 "
Draft of water { forward,		11 "	
Draft of water { aft,		13 "	
Area of immersed midship section at load draft,		310 sq. ft.	
Tonnage,	450.		
Masts, 3.—Rig—Schooner.			
ENGINES.—Upright direct action.			
Diameter of cylinders, two,			34 inches.
Length of stroke,		2 feet 10	"
Cut off,	within one half.		
Maximum pressure of steam in pounds,	45.		
Maximum revolutions at above pressure,	75.		
BOILER.—One—Return flue.			
Length of boiler,		24 feet.	
Breadth "		10 "	
Height " exclusive of steam chimney,		10 "	8 inches.
Weight " without water,	52,000 lbs.		
Number of furnaces—two.			
Breadth of "		4 "	6 "
Length of grate bars,		6 "	
Number of flues,	{ above 14. { below 10.		
Internal diameter of flues,	{ above 12 ins. { below 6 of 15 ins. and 4 of 17 "		
Length of flues or tubes,	{ above 17 ft. 6 ins. { below 10 ft. 6 ins.		
Diameter of smoke pipe,		4 feet.	
Height "		20 "	6 "
PROPELLER.—			
Diameter of screw,		10 feet	8 inches.
Length of "		2 "	
Pitch of screw,		19 "	
Number of blades,	4.		

Remarks.—Filled solid under engines. One independent steam, fire, and bilge pump. Boiler, chimney, and smoke pipe protected from com-

municating fire by felt and sheet iron. The hull is coppered. The boilers are on deck and has water bottoms. Has a poop cabin. Date of trial, December 22d, 1858. C. H. H.

For the Journal of the Franklin Institute.

Particulars of the Steamer Arizona.

Built by Harlan & Hollingsworth, Wilmington, Delaware. Intended service, New Orleans to Brazos.

HULL.—		
Length on deck,		201 feet 6 inches.
Length on deck at load line,		200 "
Breadth of beam,		34 "
Depth of hold,		10 "
" to spar deck,		17 " 6 "
Length of engine space,		75 "
Draft forward, light,		4 " 6 "
" load,		7 "
Draft aft, light,		5 " 2 "
" load,		8 " 2 "
Tonnage, { Hull,	632.	
Engine room and bunkers,	236.	
Area of immersed section at load draft,		228 sq. feet.
Speed in knots, { with tide,	$14\frac{1}{2}$.	
against tide,	10.	
Masts, 2.—Rig—Schooner.		
ENGINES.—Vertical beam—condensing.		
Diameter of cylinder,		44 inches.
Length of stroke,		11 feet.
Cut-off,		5 " 6 "
Maximum revolutions,	$17\frac{1}{4}$.	
Weight of engines,	360,000 lbs.	
BOILER.—One—Return flued.		
Length of boiler,		24 feet.
Breadth "		15 " 6 inches.
Height " exclusive of steam chests,		7 " 7 "
Weight " with water,	130,000 lbs.	
Number of furnaces,	4.	
Breadth "		3 " 5 "
Length of grate bars,		6 " 2 "
Number of flues, { above 8.		
below 8.		
Internal diameter of flues, { above 1 ft. $5\frac{3}{4}$ ins.		
below 2 ft. by 1·6 ins.		
Length of flues, { above 14 ft. 2 ins.		
below 15 ft. 6 ins.		
Heating surface,		1880 sq. ft.
Diameter of smoke pipe,		5 " $3\frac{1}{2}$ "
Height "		33 " 8 "
Load on safety valve per square inch,	30 lbs.	
Consumption of coal per hour,	$\frac{7}{8}$ ton.	
PADDLE WHEELS.—		
Diameter overboards,		30 feet.
Length of blades,		6 " 6 inches.
Depth of blades,		22 "
Number "	21.	

Remarks.—Frame ▌ $3\frac{5}{8}$ ins. × 1 in.—18 ins. apart; 12 strakes of

plates from keel to gunwale, ⅜ to ½ inch thick; four bulkheads. Diameter of rivets ⅝ and ¾. Distance apart, 2 inches; single riveted. Depth of keel, 5 ins. Dimensions of ditto U ½ inch plate. One independent steam, fire, and bilge pump. Flanch iron clamped around the gunwale 24 ins. in width by ½ inch thich, with knees to each frame. Keelsons, 12; fore and aft, 20 inches high. Date of trial Jan. 1859.

C. H. H.

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*The Drinking Waters of the Metropolis.** By Edwin Lankester, M.D., F.R.S., M.R.I.

[Abridged from a paper read at the Royal Institution.]

The water used in London for drinking purposes is obtained from both rivers and springs. The Thames and the New River, and partially other rivers, supply the river water. The spring water is of two kinds. First, from surface wells, obtained by digging through the gravel which covers the London clay in the western parts of the metropolis, and into the clay itself. Secondly, from deep wells, which generally pass through the London clay and penetrate the chalk below. The surface wells receive the soakage of the water which falls over London, and the water is contaminated by the contents of cesspools, drains, and sewers. The deep wells receive their supply of water from the chalk which forms the sides of the great "London Basin." All these waters contain more or less of the following mineral constituents:—

1. *Carbonate of Lime*, of which 3 to 17 grains are contained in the gallon. The carbonate of lime is the most common source of the *hardness* of the waters of London. It may be got rid of by Clark's process, which consists in adding lime to the water. This process would greatly improve the Thames water. This plan is carried out most successfully on a large scale at Plumstead. It was recommended by the government Commissioners, on account of its "health, comfort, and economy."

2. *Sulphate of Lime*, in the proportion of from 1 to 15 grains in the gallon. It decomposes in contact with organic matters, and produces sulphureted hydrogen. Very small quantities of organic matter serve to produce this effect.

3. *Chloride of Sodium* exists in Thames water, from 1 to 4 grains in the gallon; in deep wells, from 10 to 17 grains; and in surface wells, from 20 to 40 grains. In the Thames it may be the produce of the tide; in the deep wells it is washed out of the chalk; but in the surface wells, where it is most abundant, it is derived from the animal and vegetable refuse of the houses through which it percolates. The analyses of above one hundred of these wells showed that they were all equally open to suspicion on this point.

4. *Phosphates and Silica* exist in all the London waters in small quantities.

5. *Ammonia* also has been detected in small quantities in the Thames;

* From the London Mechanics' Magazine, July, 1858.

in much larger and more appreciable quantities in the surface wells. This substance is the result of the decomposition of animal matter, and in the surface wells is undoubtedly derived from human excretions.

6. *Nitrates* result from the oxidation of the ammonia. They are absent in deep wells, exist only in very small quantities in the Thames, but in large and sometimes even dangerous quantities in surface wells. In one water, examined by Mr. Noad, above 50 grains in the gallon were detected.

The *organic* matters are not injurious when fresh or recent, but they assume certain conditions of decomposition which occasionally render them deadly. Their influence may be estimated by the case of the Lambeth and Vauxhall Water Company's supply, during the years 1848 and 1854,—two years in which cholera visited London. In 1848, both companies derived their supply of water from the Thames at Battersea, and both supplied the same district with water, and the houses supplied were equally visited with cholera.

But in 1854, the Lambeth Company obtained an improved supply high up the Thames, at Ditton. The consequence was, according to Dr. Snow's calculations, that the deaths amongst the population supplied by the Vauxhall Company, as compared with the Lambeth, was as 7 to 1; according to the most favorable view of the case, as given by Mr. Swain, it was $3\frac{1}{2}$ to 1. There is nothing to account for this difference but the larger quantity of organic impurity in the water supplied by the Vauxhall Company, which still obtains water from the more impure source. The outbreak of cholera in the Golden-square district in September, 1854, was traced to the pump in Broad street, which was subsequently found to have communicated with the drain of a neighboring house.

It appears, also, that water containing organic matter acts on lead, and thus adds another source of poisoning to its own. This had been pointed out by Mr. Noad and Dr. Medlock. Organic matters in standing water undergo a kind of fermentation, by which carbonic acid, sulphureted hydrogen, and other gases are got rid of, and nitric acid is formed. The water thus undergoes a process of self-purification. This occurred in Thames water, and accounts for the fact that ships were often supplied with water from the Thames below London Bridge. This water is dangerous to drink before or during the fermenting process.

The appreciation of small quantities of organic matters by chemical processes is a difficult process. During the evaporation of water, the organic matters are dissipated, and not all left in the evaporating basin.

The microscope is an important aid. It detects the nature of organic impurities. These consist of *dead* and *living* animal and vegetable matters. The dead consist of the tissues of animals and plants. The source of these impurities can in some instances be made manifest. Such impurities are very manifest in the Thames and surface-well waters, scarcely to be detected in the deep-well waters. The living matters consist of plants and animals. The filaments of microscopic *Fungi* have been found in impure well water. They have been detected.

in several waters known to have been productive of disease. The lecturer had recorded two instances (*Quarterly Journal of Microscopical Science*, vol. iv, p. 270), and others had been published.

Amongst the living animals, the forms of *Infusoria* are most abundant. These are frequently indicative of the impure condition of water. Eggs of the higher animals are not unfrequently found in the Thames water; and some of these undoubtedly belong to those forms of *Annulosa* which find their highest development in the human body.

Many of these forms of animal and vegetable life are not injurious in themselves; but they are most numerous where there is the greatest amount of impurity, and are a measure of the greater or less objectionable nature of a water for drinking purposes. They are not present in water freshly drawn from deep wells.

From these circumstances it is concluded that the water from deep wells is most desirable and unobjectionable as drinking water; *that the water from surface wells ought under no circumstances to be drunk at all;* and that, if Thames water is used, it ought to be filtered, or, what is better, *boiled and filtered.* Boiling expels the carbonic acid from water, and renders it vapid; but its briskness may be restored by passing it through the gazogene. In the filtration of water various agents may be used, as sand, sponge, charcoal, rock, &c. The most effectual is animal charcoal, which may be introduced into any of the ordinary forms of filter. Dr. Medlock has shown that the addition of iron to water containing organic impurities precipitates them without rendering the water metallic. Water which had been filtered in contact with iron twelve months since is still quite pure, while water which has not been thus filtered shows a large quantity of impure vegetable growth.

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*Hearder's Patent Telegraph Cables.**

The invention consists of an improved mode of insulating telegraphic wires for submarine purposes, so as to lessen the inductive action usually known as a statical charge of the surfaces of the insulating sheath or covering, after the manner of a Leyden jar, which action now interferes with the operation of the simple dynamic electric current. He effects this in the following manner:—First, he covers the conductor with cotton, silk, wool, hair, flax, or other fibrous or porous substance or substances, in any of their forms, in one or more layers, previously to coating it with the insulating material, which material may be india rubber, gutta percha, or any of their compounds, or any other insulating composition; or, secondly, he coats the wire with the insulating material, and then applies any of the before-mentioned porous or fibrous substances over the insulating coat, and covers the whole again with the insulating material, and, if necessary, puts on additional alternate layers of fibrous and insulating material; or, thirdly, coats the conductor with the fibrous, porous, or textile materials in the manner described in the first process, and then applies the alternations of insulating and fibrous materials in the manner described in the second process.

* From the London Mechanics' Magazine, September, 1858.

The porous, fibrous, or textile material with which the conductor is covered, or which is inserted between the layers of the insulating medium, is better for having its porosity preserved as much as possible consistently with the required strength of the cable.

The precise mode of laying on the fibrous materials may vary according to circumstances, but he prefers to lay them on when used in the form of threads or strands in a long spiral direction; and, when more than one layer is used, each layer is better for being put on in the direction opposite to the former one; or, where economy is not a great object, they may be braided on. When in the form of tapes or strips, they may either be wrapt spirally around, or laid longitudinally along the insulated or uninsulated wire, and folded round it; the latter mode being preferable, as it gives greater strength. In all cases, he recommends the employment of a soft, adhesive insulating medium, which shall adhere to the fibrous material as well as to the surface of the more solid insulating substance used for the several castings in order to prevent the layers from sliding over each other. He does not, however, confine himself to any of these plans, but merely recommends them as among the best modes of combining the porous or fibrous substances with the insulated material.

As telegraph cables are usually constructed, the gutta percha or other insulating substance which encloses the conductor, acts the part of a Leyden jar, the internal conductor serving as the inner coating, and the water as the outer coating; and his object is to interpose a fibrous or porous substance between the wire and the insulating coating, in order to prevent the contact of the metal with the homogeneous surface of the insulating medium; and, for a similar reason, he also puts on the outer layer or layers of porous and insulating materials, viz: to prevent the water, or other external conductor, from coming in contact with and forming an external coating to the insulating sheath, which more immediately includes the conductor.

Where two or more conductors are to be embodied in the same cable, he takes the requisite number of conductors prepared in any of the ways aforesaid, and either binds them together with the porous materials before described, and then covers them with insulating medium, or unites and covers them with insulating medium at once; or he applies the porous, fibrous, or textile material and the insulating medium over the whole, when thus united, in alternate layers, as before described.

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*On the Annual Yield of Nitrogen per Acre in Different Crops.** By J. B. Lawes, F.R.S., F.C.S., and J. H. Gilbert, Ph.D., F.C.S.

In a paper given last year at the Dublin Meeting, on the question of the Assimilation of Free Nitrogen by Plants, and some allied points, the authors had stated in general terms, that the amount of nitrogen yielded per acre, per annum, in different crops—even when unmanured—was considerably beyond that annually coming down, in the forms

* From the London Chemical Gazette, No. 385.

of ammonia and nitric acid, in the yet measured and analyzed aqueous deposits from the atmosphere. The investigations then referred to were still in progress; and a desirable introduction to the record of the results would obviously be, to illustrate by reference to direct experiment, that which had been before only assumed, regarding the yield of nitrogen in our different crops. To this end, had been determined, the annual produce of nitrogen per acre, in the case of various crops, which were respectively grown for many years consecutively on the same land; namely, wheat, 14 years; barley, 6 years; meadow hay, 3 years; clover, 3 years out of 4; beans, 11 years, and turnips, 8 years. In the majority of the instances referred to, the yield of nitrogen had been estimated, both for the crop grown without manure of any kind, and for that with purely mineral manure—that is, excluding any artificial supply of nitrogen. It was the object of the present communication to give a summary view of some of the facts thus brought to light.

Beans and clover were shown to yield several times as much nitrogen per acre as wheat or barley. Yet the growth of the leguminous crops, *carrying off* so much nitrogen as they did, was still one of the best preparations for the growth of wheat; whilst *fallow* (an important effect of which was the accumulation within the soil of the available nitrogen of two years into one), and *adding nitrogenous manures*, had each much the same effect in increasing the produce of the cereal crops.

Other experimental results were adduced, which illustrated the fact, that 4 years of wheat, alternated with *fallow*, had given as much nitrogen in the 8 years as 8 crops of wheat grown consecutively. Again, 4 crops of wheat, grown in alternation with *beans*, had given nearly the same amount of nitrogen per acre as the 4 crops grown in alternation with fallow; consequently, also much about the same as the 8 crops of wheat grown consecutively. In the case of the alternation with *beans*, therefore, the whole of the nitrogen obtained in the beans themselves was over and above that which was obtained during the same series of years in wheat alone, whether it was grown consecutively, or in alternation with fallow.

Interesting questions arose, therefore, as to the varying sources, or powers of accumulation, of nitrogen in the case of crops so characteristically differing from one another as those above referred to.

It has been found that the leguminous crops, which yielded in their produce such a comparatively large amount of nitrogen over a given area of land, were not specially benefited by the direct application of the more purely nitrogenous manures. The cereal crops, on the other hand, whose average yield of nitrogen under equal circumstances was comparatively so small, were very much increased by the use of direct nitrogenous manures. But it was found that, over a series of years, only about $\frac{4}{10}$ths of the nitrogen annually supplied in manure for wheat or barley (in the form of ammonia salts or nitrates), were recovered in the immediate increase of crop. Was any considerable portion of the unrecovered amount drained away and lost? Was the supplied nitrogenous compound transformed in the soil, and nitrogen in some form

evaporated? Did a portion remain in some fixed and unavailable state of combination in the soil? Was ammonia, or free nitrogen, given off during the growth of the plant? Or, how far was there an unfavorable distribution, and state of combination, within the soil, of the nitrogenous matters applied directly for the cereal crops—those, such as the leguminous crops, which assimilated so much more, gathering with greater facility, and from different ranges of soil, and leaving a sufficient available nitrogenous residue within the range of collection of a succeeding cereal crop? These questions, among others which their solution more or less involved, required further elucidation, before some of the most prominent of agricultural facts could be satisfactorily explained.

Comparing the amount of nitrogen yielded in the different crops, when grown without nitrogenous manures as above referred to, with the amount falling in the measured aqueous deposits, as ammonia and nitric acid, it appeared, taking the average result of the analysis of three years rain, that all the crops yielded considerably more, and some very much more, than so came down to the soil. The same was the case when several of the crops had been grown in an ordinary rotation with one another, but without manure, through two or three successive courses. Was this observed excess in the yield over the yet measured sources, at all materially due merely to exhaustion of previously accumulated nitrogenous compounds within the soil? Was it probably attributable chiefly to the absorption of ammonia or nitric acid from the air, by the plant itself, or by the soil? Was there any notable *formation* of ammonia or nitric acid, from the free nitrogen of the atmosphere? Or, did plants generally, or some in particular, assimilate this free nitrogen?

As already intimated, some of the points which had been alluded to were at the present time under investigation; the authors having in this, the able assistance of Dr. Pugh. Others, it might be hoped, would receive elucidation in the course of time. There, of course, still remained the wider questions—of the original source, and of the distribution and circulation of *combined nitrogen* in the soil, in animal and vegetable life on the earth's surface, and in the atmosphere above it?

FRANKLIN INSTITUTE.

Proceedings of the Stated Monthly Meeting, February 17, 1859.

John C. Cresson, President, in the chair.

John Agnew, Vice President. } Present.
I. B. Garrigues, Recording Secretary. }

The minutes of the last meeting were read and approved.

Letters were read from the K. K. Geologischen Reichstanstalt, Vienna, Austria; and Edward Miller, Esq., of St. Louis, Missouri.

Donations to the Library were received from the Commissioner of Patents, and the Statistical Society, London; the K. K. Geologischen Reichstanstalt, Vienna, Austria; L. A. Huguet-Latour, Esq., and George W. Weaver, Esq., Montreal, Canada; the Regents of the University of the State of New York, Albany, New York; Edward Miller, Esq., and the St. Louis Mercantile Library Association, St. Louis, Missouri; Cornelius A. Walborn, Esq., Pennsylvania Legislature, Harrisburgh, Penna., and from Dr. T. B. Wilson, Prof. John C. Cresson, Prof. B. H. Rand, Philip Price, Esq., and the Mercantile Library Association, Philadelphia.

The Periodicals received in exchange for the Journal of the Institute, were laid on the table.

The Treasurer's statement for January 1859, was read.

The Board of Managers and Standing Committees reported their minutes.

Candidate for membership in the Institute (1) was proposed, and the candidates proposed at the last meeting (3) were duly elected.

The Standing Committees for the ensuing year were appointed by the President, and approved as follows:

On the Library.	*On Cabinet of Models.*	*On Cabinet of Minerals.*
John Allen,	Wm. B. Bement,	Isaac H. Conrad,
James H. Cresson,	Spencer Bonsall,	John F. Frazer,
George Erety,	Wm. H. Clark,	F. A. Genth,
B. B. Gumpert,	Richard H. Downing,	Isaac B. Garrigues,
Raper Hoskins,	George C. Howard,	John L. Le Conte,
James T. Lukens,	Henry Howson,	J. P. Lesley,
Samuel Middleton,	Coleman L. Nicholson,	B. Howard Rand,
Henry K. Plumly,	John L. Perkins,	Robert E. Rogers,
John H. Quail,	Charles E. Smith,	John C. Trautwine,
Thomas S. Stewart.	Charles J. Shain.	Wm. M. Uhler.

On Cab. of Arts & Manuf.	*On Exhibitions.*	*On Meetings.*
James C. Booth,	John E. Addicks,	Wm. B. Atkinson,
Thomas Bickerton,	John Agnew,	James H. Billington,
Samuel Broadbent,	James H. Bryson,	James Dougherty,
Henry Bower,	James H. Cresson,	Henry Howson,
Robert C. Cornelius,	John M. Gries,	Washington Jones,
Edward P. Eastwick,	William Harris,	Angus F. Macpherson,
David M. Hogan,	Thomas S. Stewart,	Wm. D. Parrish,
Edward H. Ladd,	William Sellers,	B. Howard Rand,
Wm. S. Levering,	Isaac S. Williams,	Richard A. Tilghman,
Henry J. Taylor.	Thomas J. Weygandt.	Joseph K. Wheeler.

On Meteorology.

Chas. M. Cresson,	Alfred L. Kennedy,
John F. Frazer,	James A. Meigs,
Samuel S. Garrigues,	Fairman Rogers,
E. Otis Kendell,	James A. Sommerville,
James A. Kirkpatrick,	Thomas J. Weygandt,

Abstract of Meteorological Observations for December, 1858; made in Philadelphia, Somerset, and Huntingdon Counties, Pennsylvania, for the Committee on Meteorology of the Franklin Institute.

PHILADELPHIA.—Lat. 39° 57′ 28″ N. Long. 75° 10′ 28″ W. Height above the sea 50 feet. Prof. J. A. KIRKPATRICK, Observer.

December, 1858.	Barometer. Mean.	Barometer. Mean daily range.	Thermometer. Mean.	Thermometer. Daily oscillation.	Thermometer. Mean daily range.	Relative humidity. 2 P. M.	Force of vapor. 2 P.M.	Rain.	Prevail'g winds.
	Inch.	Inch.	°	°	°	Per ct.	Inch.	Inches.	Direc.
1	30·249	·423	32·2	11½	4·8	61	·129		N W.
2	30·119	·132	35·0	10	2·8	90	·191	0 345	N E.
3	29·970	·149	40·8	20	5 8	77	·260		S W.
4	29·9 .3	·047	46·3	11½	5·5	78	·283	0·057	(var.)
● 5	29·789	·134	41·7	5	4 7	91	·244	0·042	N E.
6	30·000	·211	44·7	14	5·0	40	·149		N W.
7	29·900	·148	39·3	7½	6·0	91	·225	0·300	E.
8	29·828	·151	30·0	9	3·7	91	·216	0·768	N W.
9	30·221	·393	26·7	11	12 3	58	·100		N W.
10	30·274	·150	26·0	14	3·0	52	·089		S W.
11	30·074	·199	34·5	14	8·5	55	·130		S W.
12	30·212	·138	37·5	10	3·0	65	·168		N N E
☾ 13	29·967	·245	43 3	12	5·8	92	·286	0·565	(var.)
14	29·730	·237	54·2	21	10·8	93	·404	0·122	S W.
15	29·668	·118	56·3	6	6·8	87	·407	0·272	S W.
16	29·983	·314	42·7	11	13·7	48	·155		N W.
17	30·040	·057	36·7	13	6·0	52	·150		N W.
18	30·195	·155	28·0	7	8 7	58	·100		N N W.
19	30 167	·120	27·7	20	5·0	67	·112		N N E.
○ 20	29·829	·338	40·8	13	13·2	76	·228	0·258	(var.)
21	29 390	·439	41·7	4	2·5	91	·254	0·864	N E.
22	29·698	·343	41·3	11	1·0	37	·107		N W.
23	29·807	·220	38·8	16	4·5	61	·182		S W.
24	30·070	·284	35·0	13	8·2	46	·110		W N W
25	30·440	·370	29·0	16	7·3	67	·137		N W.
26	30 229	·211	31·3	16	2·3	52	·116	0·155	(var.)
☽ 27	29·925	·271	41·5	13	10·2	58	·185		W.
28	29·911	·013	39·7	13	1·8	33	·102		N W.
29	29·874	·037	29·3	8	10·3	94	·150	0 430	N E.
30	29·965	·119	28·7	6	3·3	89	·142	0 837	N E.
31	20·752	·212	37·3	10	8·7	90	·207	0·444	N E.
Means	29·974	·206	37·6	12	6·3	69	·172	5·459	N34°W

SOMERSET, Somerset Co. Lat. 40° N., Lon. 79° 3′ W. Height 2195 feet. GEO. MOWRY, Observer.

December, 1858.	Barometer. Mean.	Barometer. Mean daily range.	Ther. Mean.	Ther. Mean daily range.	Relative humidity. 2 P. M.	Force of vapor. 2 P.M.	Rain and melt'd Snow.	Prevail'g winds
	Inch.	Inch.	°	°	Per ct.	Inch.	Inch.	Direc.
1	27·889	·263	26·[illegible]	2·0	80	·170		(var.)
2	27·763	·126	39·3	13·3	100	·299	0·206	W.
3	27·701	·062	43·0	4·3	100	·288		S W.
4	27·586	·115	51·3	8 3	100	·403	0·264	S W.
● 5	27·503	·114	55·7	7·0	97	·530		(var.)
6	27·740	·237	40·7	15·0	68	·252		S.
7	27·583	·157	41·3	8·7	100	238	0·145	(var.)
8	27·654	·114	30·0	11·3	80	·161	0·318	W.
9	27·064	·310	12·7	17·3	91	·080		W N W
10	27 900	·123	22·7	12·7	62	·121		W S W.
11	27·785	·114	35·0	12·3	75	·208		W.
12	27·825	·043	37·7	3·3	66	·177		(var.)
☾ 13	27·648	·177	43·3	5·7	100	·288	0·755	S.
14	27·440	·208	53·0	9·7	100	·388		W S W.
15	27·489	·143	44·7	8·3	100	323	0·769	W.
16	27·754	·264	32·0	12·7	81	·186		W.
17	27·790	·036	31·7	1 7	80	·170		W N W
18	27·838	·048	30·7	2·3	90	·191		?
19	27·732	·111	34·0	4·0	83	·221	0·194	S.
○ 20	27·514	·217	38·7	4·7	83	·221	} 0 570	(var.)
21	27·168	·346	44·0	5·3	100	·323		W.
22	27·642	·474	31·3	12·7	75	·156		W.
23	27·528	·142	37·0	5·7	61	·191	0·105	W.
24	27 882	·354	25·0	12·0	100	·147		W N W
25	28 061	·180	23·3	6·3	58	·114		S E.
26	27·810	·251	34·3	11·0	73	·181	0·458	(var.)
☽ 27	27·727	·083	39·3	5·0	91	·234		W.
28	27·673	·054	34·3	5·0	72	·173		(var.)
29	27·438	·235	31·0	3·3	100	·181	0·558	S.
30	27·546	·122	28·7	2·3	100	·160		S.
31	27·449	·098	34·7	6·0	100	·220	0·512	S.
Means	27·678	·172	35·7	7·7	86	·226	4·944	

HUNTINGDON, Huntingdon County. JACOB MILLER, Observer.

December, 1858.	Barometer. Mean.	Barometer. Mean daily range.	Ther. Mean	Ther. Mean daily range.	Rain and Snow.	Prevail'g winds.
	Inch.	Inch.	°	°	Inch.	Direc.
1	29·681	370	28·3	5·0		N.
2	29 502	·178	35·0	6·7	0·243	S.
3	29·374	·120	38·7	3·7	0·093	S.
4	29·284	·090	39·3	2·7	0·322	S.
● 5	29·164	·119	44·7	5·3	0 008	N.
6	29·447	·283	38·3	7·7		W.
7	29·312	·135	39.3	5·0	0·257	E.
8	29·323	·161	35·7	5·0		W.
9	29·739	·416	21 3	14·3		W.
10	29·675	·159	22 7	6·0		(var.)
11	29 507	·168	29·3	6·7		(var.)
12	29·617	·110	35·3	7 3		E.
☾ 13	29·377	·240	39·0	3·7	0·250	S E.
14	29·082	·295	44·3	4·0	0·481	W.
15	29·107	·182	48·7	6·3	0·018	N.
16	29·446	·339	37·0	11·7		N.
17	29·522	·076	35·3	1·7		N.
18	29·649	·127	28·7	6·7		N.
19	29·501	·162	31·0	3·7		S.
○ 20	29·234	·267	37·3	6·3	0·320	S.
21	28·789	·445	41·3	4·0	0·588	S.
22	29·283	·494	36·0	5·3		W.
23	29·199	·193	36·7	9·3	0·009	W.
24	29·622	·423	33·0	11·0		N.
25	29·855	·233	23·0	10·0		N.
26	29·593	·263	27 3	5·0	0·187	N.
☽ 27	29·423	·169	41 7	14·3		W.
28	29·400	·036	37·0	4·7		N.
29	29·245	·154	32·0	5·0	0·216	E.
30	29 372	·127	30 0	2·0	0·325	E.
31	29 228	·144	35·0	5·0	0·167	N W.
Means	29·405	·216	34·9	6 3	3·484	

JOURNAL

OF

THE FRANKLIN INSTITUTE

OF THE STATE OF PENNSYLVANIA,

FOR THE

PROMOTION OF THE MECHANIC ARTS.

APRIL, 1859.

CIVIL ENGINEERING.

For the Journal of the Franklin Institute.

Steam and its Condensation. By Thomas Prosser, C. E.

CHAPTER II.

Introductory and General Observations.

One chapter* has already appeared on this subject, but in consequence of the Hon. Isaac Toucey, Secretary of the U. S. Navy having appointed a Board of Engineers to examine into the invention described in Vol. xxxvi, (3d Series,) p. 88 of this *Journal*, and exemplified by a colored Plate constituting Chapter I; a few more chapters are purposed with the view of further elucidating the subject, and more fully sustaining the theory on which that invention rests.

I am as much indebted to Sir John Leslie† for remarking, that, "near the freezing point, water is scarcely a better conductor of heat than ice, but as it approaches ebullition it gains such an increase of *mobility* as to conduct heat *five* times faster than in its torpid state," as Mr. Watt was to Dr. Black ‡ when he was informed by him of the existence of latent heat. Mr. Watt wrote, § "when once the idea of the separate condenser was stated all these improvements followed as corollaries, in quick succession." I would write, when once the idea of getting rid of the air-pump was started, all these improvements followed as corollaries in quick succession; but the coincidence is rather Hibernianish, I admit.

* Journal of the Franklin Institute, Vol. xxxvi, (3d Series,) page 88.
† Leslie's Observations, &c., on Heat and Moisture, page 17.
‡ Farey on the Steam Engine, page 312. § Ibid. page 314.

I wish to show the propriety of adopting some method of examination which will give actual, practical, and not mere theoretical results, for comparison between the *effective* working of my surface condenser and any other.

This cannot be done by the application of the indicator and thermometer, for the former gives no account of its own friction, of the steam condensed in the cylinder, nor of the water which enters it in a vesicular state. The thermometer gives the temperature of the feed water, it is true, but not the quantity. They are only valuable in a comparison of two engines of the same class, but are entirely useless in comparing my method of applying and condensing steam with any other. The indicator is an excellent instrument, but not a perfect one, and is unfortunately, just now, overrated in proportion to the neglect and indifference with which it has been regarded, until very recently, although it was invented about seventy-four years ago. The consequence is, that the usual calculations of the power of steam engines is fallacious in the extreme, and *made up* of mere conceits, mostly on the authority of Tredgold, who, although a thorough practical man himself, has reduced the friction of every particle of moving matter connected with the steam engine, to a mere impracticable theory, for the difference in workmanship alone may double or treble most of the calculations, and yet not be perceptible to the most skilful engineer, without a thorough and careful examination.

Nevertheless, the steam engine itself is the veriest embodiment of a *theory* of the laws of nature as understood in the operations of vaporization, condensation, and conduction of heat. These laws must govern its actions, and every real improvement must have for its object, conformation to them, and not mere subterfuges to avoid the consequences of their violation.

Practical experience had nothing to do with the invention of the low pressure condensing steam engine as we now find it, for, the air-pump, the separate condenser, the double action, were all the mere dreams of a civil engineer who never had any experience as a *practical engineer*, as the term is now commonly understood, and yet, James Watt was a most thoroughly practical and philosophical engineer, for he put into practice that which his philosophy had conceived. Had he died when he first became acquainted with Dr. Rœbuck, his invention would have been set down as the dream of a philosopher.

It will be seen that in this view of the case the natural order is just reversed, and the physical power of steam, which rests upon a theory, is measured practically,* while the power of the steam engine itself, which is altogether a practical machine, is measured theoretically.

Complicated mechanism, too often passes for skilful arrangement, and I cannot but think, notwithstanding the high estimation in which I hold the inventive genius of Mr. Watt, that the introduction of the air-pump has been fraught with immense loss to the whole world.

Mr. Watt, himself, never obtained more than 60 per cent. of the power of the full steam. For one pound of steam at 12·572 lbs. per square inch, has a mechanical power equal to raising 56,778 lbs. 1 foot,

* By the Indicator, whether the steam is high or low pressure, and however rapidly the piston reciprocates.

and deducting from that (= 2·095 lbs. per square inch for back pressure) 9463 lbs. raised one foot high, we have 47·315 to be divided by 33,000, which gives 1·434 H. P. from one pound of such steam, or 1 H. P. from ·7 lbs., but Mr. Watt obtained in effective work done but 1 H. P. from 1·156 lbs.* It is even said that he calculated to evaporate 1·7 lbs.† of water per minute per H. P., and if so, the coal consumed to evaporate it being ·1344 lbs., must have evaporated at the rate of 12·649 lbs. of water to 1 of coal, while the *calculation* is that 1 lb. of coal evaporated but 8·62 lbs.‡ of water, and 8·064 lbs. of coal per hour gave 1 H. P.; but we are far from being certain that the bushel of coal weighed no more than the 84 lbs., which it was taken at, for there has always been a looseness as to that matter, and which continues to the present day according to a recent writer in the *Journal of the Franklin Institute.* But this was an extraordinary performance and far exceeded any average, for the H. P. was nearly equal to the grinding of one bushel (60 lbs.,) of wheat per hour, with 8·064 lbs. of coal, a feat which *no* engine of the present day can equal, and yet we hear of inventions which enable steam engines to perform work equal to 1 H. P., with a consumption of two or three pounds of coal per hour, *made up* of indicator diagrams, cut-offs, governors, and steam gauges.

The indicator merely gives the data for obtaining the power developed, but it gives none for obtaining the effective power applied to a useful purpose. It tells nothing of the condensed steam and vesicular water which passes uselessly, and which is by many supposed to exceed the useful steam which enters the cylinder. That the condensation of steam in the cylinder is enormous, is proved by the fact, that although air is a very bad conductor of heat, yet no expense is thought too great to protect the outside of the cylinder from it, in cases where it tells upon the work done, and that work can readily be measured as in pumping engines. And yet, that is nothing compared with the condensation going on inside the cylinder, which is as the product of the difference of temperature between the boiler and condenser, multiplied by the area exposed to it in the cylinders. Externally, then, the exposure of the heated cylinder, is to ordinarily dry air which absorbs the heat very slowly; internally, it is conveyed with immense velocity by the steam to a surface of iron, which absorbs it *instantaneously* so long as there is any difference of temperature between them.

In the three condensers which I shall investigate, I have assigned values which I believe will always be found reasonable; for instance, I have assigned to Hall's system of condensation 18 per cent., to Pirsson's 10 per cent., and to my own 2 per cent. of steam condensed in the cylinders, which I believe is far below the truth in the two first cases. These are rough calculations, but are sufficiently accurate for the present purpose. I have selected Hall's and Pirsson's surface condensers to compare with my own, because they have both attained a position which no others have. Hall's condenser was a noble invention, but the air-pump killed it, while Pirsson's still exists in public

* Farey on the Steam Engine, page 515. † Ibid. page 577. ‡ Ibid. note on page 516.

favor most unaccountably, for although in many respects superior to Hall's, principally on account of using less cold water, yet its inability to supply itself with distilled water to make up for the waste, must cause it to follow its illustrious predecessor, as too imperfect and too complicated a machine for the present day. Any condenser which does not make ample provision for recuperating the boiler waste water in the simplest, most certain and efficient manner, is a failure.

CHAPTER III.

Tabulated facts or data, giving the main features of the theories of Hall's, Pirsson's, and Prosser's systems of condensation, with their effects upon the vaporization, condensation, and absorption of heat.

TABLE I.

	Hall.			Pirsson.			Prosser.		
	°C	Avg.	Diff.	°C	Avg	Diff	°C	Avg	Diff.
Temperature of steam in the boiler, say,	110	66		140	95		198	150	
Temperature of feed water entering boiler,	22			50			102		
Coefficient of absorption—see Table II.,		364			480			700	
Temperature of steam entering the cylinder,	106	59	94	130	90	80	180	142·5	75
Temperature of steam entering the condenser,	12			50			105		
Condensing water entering,	6	10·5	9	6	28	44	6	53·5	95
Condensing water leaving,	15			50			101		
2 Differences of averages,			48·5			62			89
3 Coefficient of absorption—see Table II.		142			212			314	
Total heat in the steam entering the cylinder,	638·8			646·1			661·4		
4 Total heat in the feed water,	22		616·8	50		596·1	102		559·4

This Table is necessarily arbitrary, but is believed to be sufficiently correct for the purpose intended. The Table following is founded on the experiments of Sir John Leslie, which I have before referred to. I am not strictly justified however, in carrying it beyond the boiling point, nearly up to which I have myself proved the correctness of the theory, but surely I cannot err in carrying it much further than I have done. That theory is, that, *water at the boiling point absorbs heat five times more rapidly than it does at the freezing one.*

TABLE II.

Formula 100·+·4 for each degree Centigrade.	
Coefficient of Absorption.	Temperature.
100	0°C.
142	10·5
212	28 0
314	53·5
364	66 0
480	95 0
500	100·0
700	150·0

This Table has a most important bearing on the subject of absorption of heat by water. It shows, that the higher the temperature of

the water which absorbs the heat, the more rapidly will it perform that office. Of course it does not abrogate that other law, of difference of temperature, without which there can be neither absorption nor condensation.

—

CHAPTER IV.

On Boilers and Boiler Water.

The importance of absolutely pure water in boilers cannot be too strongly insisted upon, for on that depends, not only the economy of fuel, but the durability of boilers also; for pure water absorbs heat much faster than any other, and has no perceptible effect upon *pure* iron, and therefore the metal allows the heat to pass more rapidly, to an extent which will astonish engineers when steel tubes come into vogue, as they must do sooner or later. The water indeed, in almost any state, is ready enough to absorb the heat, but when it is at all impure, the deposit from it which coats over the whole interior surface of the boiler, and more particularly the hottest parts of it, will not allow it to pass. The best boiler water becomes bad in a few hours from this cause. If water contains but 2 gr. of solid matter per gallon, (and there is no river water so pure as that) and one gallon per minute be evaporated from a boiler containing 100 gallons, the whole will contain 26 grs. per gallon in 20 hours, and that makes very bad boiler water. Blowing through, wastes fuel, but gets rid of the loose deposit, but not of the non-conducting substance which coats over every part of the boiler, nor of those most destructive ones which attack the iron and destroy it in from five to ten years, which, with pure water alone, should last at least twenty or even thirty years.

Graham says,* that the loss produced by a scale of sulphate of lime of not more than one-sixteenth of an inch thick, amounts to 14·7 per cent. He also bears witness to the fact of the great economy of fuel in the evaporation of water "from the increased results obtained with increase of pressure, and apparently due to that condition." We can now see how it is that old boilers never work so well as new ones; new boilers are always paragons (see Bourne on the Steam Engine, p. 64,) of perfection. Now a boiler which never has anything but distilled water in it, is always equal to new, and hence, although I can instantly convert my steam engine from a condensing into a non-condensing one, no fair comparison can be made between the economy of the two methods of working, unless mine is continued long enough to deposit the usual mud and scale on the boiler, so as to bring it to the usual state of a boiler working under ordinary circumstances. I claim that there is a saving of at least 10 per cent. from this cause over any other surface condenser; for, by whatever other means the boiler waste is recuperated, it just amounts to a boiler and distilling apparatus of large proportions, and whether separate, as in Ericsson's, or combined, as in Hall's and Pirsson's condensers, it is too cumbersome and complicated, and has been abandoned, for engineers will not be bothered with the working of them—they may just as reasonably be expected to keep a distillery

* Journ. Franklin Inst. vol. xxxvi, (3d series,) p. 14.

on board to make their own grog—and therefore, they pump the salt water into the boiler to its certain destruction.

From an inspection of the Tables I and II, Chapter III, it will be seen, that to evaporate the same amount of water in the same space of time, will require very different areas of heating surfaces, being inversely as the rate of absorption of heat by the boiler, that rate being in direct proportion to the difference of average temperature of the fire and gaseous products in the furnace, and the average temperature of the water in the boiler, combined with the coefficient of absorption due to the latter. The most important point however, in regard to calculating for the equivalent area of heating surface, is the total heat required to be restored to the feed water after it enters the boiler, that is to say, the difference between the total heat in the feed water entering the boiler, and leaving it as steam, or rather as entering the cylinder.

Omitting all consideration of the heat in the furnace and boiler as being an unnecessary refinement in an inquiry like this, we will assume, that 20 feet area of boiler surface is sufficient for Hall's system of working, we have for Pirsson's $=14{\cdot}657=20\ (\frac{364}{480}, \frac{596{\cdot}1}{616\ 8},)$ we have for Prosser's $=9{\cdot}432=20\ (\frac{364}{700}, \frac{559{\cdot}4}{616{\cdot}8})$, independent of allowance for condensation in the cylinder, and calculated at 18 per cent. for Hall, 10 for Pirsson, and 2 for Prosser, and also independent of 10 per cent. in favor of the latter on account of supplying pure water.

Therefore,	Hall,	Pirsson,	Prosser.
Will respectively require of boiler heating surface,	20·00	14·657	9·432
Add for condensation in the cylinder, $\frac{18}{82}$, $\frac{10}{90}$ and $\frac{2}{98}$, . . .	4·39	1·646	0·199
	24·39	16·303	9·631
Deduct on account of pure water, 10 per cent.,			0·963
			8·668
Deduct also for making up for waste, 10 per ct.,			·866
			7·802

and we have in round numbers,

24′ of boiler heating surface per H. P. per Hall.
16′ " " " Pirsson.
8′ " " " Prosser.

To restore in the boiler the total heat lost in passing through the engine and condenser *without* making up for waste, but adding 25 per cent. for that and other purposes,* and to bring up the proportion to my standard of boiler heating surface, we have respectively 30′ per Hall, 20′ per Pirsson, and 10′ per Prosser of area of boiler heating surface per H. P. to put them on a par with each other.

* One of these purposes is to give a sufficient weight of water when evaporated for one H. P., in accordance with some observations which showed that more than 1 lb. per minute is required for 1 H. P., but as they are only comparative, it is of no importance whether the assumptions are strictly correct or not. They are also made on the supposition, that the same power is obtainable from the same weight of water under all the systems, thus eliminating all the saving into space occupied and fuel consumed.

The next question for consideration is the relative quantities of fuel which will be required. This will be directly as the quantity of heat to be restored in the boiler, and inversely at the *absolute power* in the steam* entering the cylinder. Therefore, assuming that Hall requires 10 lbs. of coal per hour per H. P., we have for

$$\text{Pirsson, } 8{\cdot}2798 = 10\left(\tfrac{662{\cdot}3}{752{\cdot}2},\ \tfrac{58438}{62144}\right);$$
$$\text{Prosser, } 5{\cdot}1419 = 10\left(\tfrac{462{\cdot}4}{752{\cdot}2},\ \tfrac{58438}{69864}\right).$$

Allowing as follows, in accordance with previous calculations.

	Hall.	Pirsson.	Prosser.
Heat to be restored as per Table I,	616·8	596·1	559·4
Condensed in the cylinder, 18, 10, and 2 per cent.$=\frac{18}{82}$, $\frac{10}{90}$ and $\frac{2}{98}=$	135·4	66·2	11·4
			570·8
Deduct in favor of pure water 10 per ct., and another 10 per cent. for making up for waste, . .	——	——	108·4
Heat required to be restored in the boiler,	752·2	662·3	462·4

The absolute power in the steam at 106°, 130°, and 180° C.=58,438 lbs. 62,144 lbs., and 69,864 lbs.* raised one foot.

Something is due, and no small amount either, beyond the value in mere °C. to the economy of fuel on account of the high temperature of the boiler feed water, I mean on account of the greater economy of combustion. Then there is greater, far greater facility for using the steam expansively, while the boiler itself (which is of a novel character,) is *perfectly* safe and occupies but a small space as compared with any other of equal power. As to durability also, it is unapproachable so far as can be judged of from nearly two years' experience, not the slightest deterioration being perceptible.

I shall therefore adjudge that, for full steam, the different systems require in round numbers.

10 lbs. of coal	per hour	per H. P. as per	Hall.
8 lbs.	"	"	Pirsson.
5 lbs.	"	"	Prosser.

If any one supposes that the amount of condensation in the cylinder is an excessive allowance, I would refer to a case where it must have exceeded 40 per cent.,† and that too, in the case of a condensing engine worked with about the same pressure of steam as under Pirsson's system. With regard to that system, however, I may be permitted to explain, that I have used the term by way of distinction, on account of the more elevated temperature of the working steam and condenser over Hall's method, rather than as recognising any real difference in the principle of operation.

(To be Continued.)

* See Journal Franklin Institute, Vol. xxxvi, (3d Series,) p. 7, for the Absolute Power of Steam.

† Journal Franklin Institute, Vol. vii, (3d Series,) page 350.

Russian Inland Navigation.

(Continued from page 162.)

System of Tykvine.—The rivers which form parts of this system are the Mologa, Tschagodvstcha, the Voltchina, the Tykvine, and the Sias.

Its construction was commenced in 1802, and the navigation was begun in 1811.

The Canal of Junction, which is at the summit level of the system, is about 4 miles long. It begins at lake Laibaidino on the Tykhvinka, traverses lake Kranpino, and terminates at the Voltchina, which flows through the lakes of Somino and Vojann to the Tschagadostcha river. The Voltchina leaves, between the Somino and Vojann lakes, the name of the Somino, and from the Vojann lake to the Tschagadostcha river it is known by the name of the Govionn.

The rivers Tykhvinka and Voltchina having been rendered navigable by means of locks, are fed by the water of the lakes Pyriatina and Dolgomostchinsky near the dividing point of the system.

The whole extent of artificial navigation from the last lock on the Tykhvinka, to the last lock on the Govionn, is 128 miles, of which 86⅔ miles are on the Tykhvinka, five miles are on the summit level canal and the lakes which it traverses, and 36⅓ miles are on the Voltchina, and the lakes through which it flows.

The locks of the Tykvine system *are of wood.* Their dimensions are conformable to those of the boats known as the Tykhvinki and Sominki boats, which carry burdens of from 20 to 25 tons, and are 65 feet long and 14 broad, with a draft of water of from two to three feet.

At the first establishment of the Tykvine system the navigation was not exempt from difficulties, because in consequence of *an error in the leveling,* too few locks were built. In this season, in the years 1812, 1813, and 1814, the deficiency was hastily supplied by a system of flood-gates. These demanded a large supply of water, and the navigation was subject to serious interruptions in consequence of injuries to the works, which were lightly built with reference to the very small fall, which they had to overcome during low stages of the water, amounting to not more than two or three feet, and were incapable of withstanding the heavy floods to which the Tykhvinka is occasionally liable. This circumstance rendered it necessary to transport a part of the cargoes by land between Tykhvina and Somino.

At present, the sluices having been gradually replaced by *locks with chambers,* the transportation of cargoes by land, between Tykhvine and Somino, has almost entirely ceased, and only occurs where the opening of the canal is retarded in consequence of a late spring.

According to existing arrangements, the boats which carry cargoes, being bound to get through in a given time, are only occupied three days in passing through the whole distance occupied by the locks on the Tykvine system, and the whole trip of 551 miles, by this water,

between Rybinsk and St. Petersburg, is made in from three to four weeks. The average cost of transportation for this distance is $8·37 per ton.

The number of boats which annually pass through the Tykvine system, is about 2460 going towards St Petersburg, and 560 going toward Rybinsk. They take to St. Petersburg about 51,428 tons, and to Rybinsk, nearly 14,464 tons.

These cargoes consist principally of valuable merchandise, such as wheat, flour, potash, copper, hides, dye-stuffs, colonial produce, manufactured articles, &c., &c.

Marie System.—To this system belong the rivers Scheksna, Kovja, Vytaigra, and Svea.

In order to pass from the Scheksna into the Kovja, the boats had to traverse the Bailvagevo lake, where the navigation encounters great inconveniences, particularly at the entrance into the lake. The cargoes had to be transhipped from the river boats into vessels provided with decks; on the lake itself, adverse winds caused great delays, and during storms many vessels are lost, until these inconveniences were removed by the canal of Bailosersk, around the shore of the lake, between the mouth of the Kovja and the outlet of the Scheksna. This canal was begun, by order of the Emperor, in 1843, and finished in 1846.

The length is 40 miles and 4809 feet, the breadth is 77 feet at the surface of the water, and 56 feet at the bottom, and the depth is about seven feet.

The canal begins at the Scheksna $4\frac{2}{3}$ miles below its head, and terminates on the Kovja a short distance above its mouth.

Considerable difficulties are encountered in navigating the first $4\frac{2}{3}$ miles of the Scheksna, in consequence of the rapidity of the current, and the shallowness of the channel, which is also very crooked.

The point of departure of the border canal of Bailosersk, has therefore been chosen $4\frac{2}{3}$ miles below the port of Krokhino, or the outlet of the Scheksna from the Bailogera lake. At this point the depth is sufficient, and there is a considerable expansion of the river, and a very moderate current.

The level of the canal was fixed at 13 feet above the level of the Scheksna, and six feet and a half above that of the Kovja. *Two wooden locks* have been built for their purpose at the Scheksna end, and one at the Kovja end.

The canal is fed by means of the Konnost river, *and by immense reservoirs* formed by the lakes of Lak, Asatsk, and Fle, having an area of about 11,250 acres.

Several rivulets which empty into Bailvogera lake, on the southern side, increase the supply still further by the tribute of their waters. The Maigra, the most important of them, is closed by a retaining dike. In this way the boats, avoiding Bailvozera lake, pass from the Scheksna to the Vytaigra. The Marie canal has been built to open the passage from the Vystaigra to the Kovja.

This canal, the construction of which was begun in 1799, was opened for navigation in 1810.

The Canal of Junction, established at the summit level of the system, is about five miles long, and passes through the lake Malko-Ozero.

The navigation encounters no obstacle in the Kovja in the 28 miles of its course from its mouth to lake Bailo-Ozero, nor on the Vytaigra in the 6⅝ miles from its mouth at lake Onega.

As to the upper part of these rivers, that of the Kovja for an extent of 23½ miles, and of the Vytaigra for 39⅓ miles, to the Canal of Junction, they could not be rendered navigable otherwise than by a system of locks fed by the Malko-Ozero lake, which constitutes the dividing point of the system, and by the lake of Kovja, the waters of which are conducted to the same dividing point by a feeder about 6⅝ miles long. The extent of the artificial part of the system of Marie from the last lock on the Kovja to the last one on the Vytaigra, is 68⅝ miles. Boats lightly loaded traverse this distance in three days, and those fully charged, are about eight days in making the same trip. The locks of the Marie system *are wood* with dimensions suitable for the class of boats which make use of them. These boats are about 84 feet long and 28 broad. They draw about four feet of water and carry about 150 tons.

Among the locks on the Vytaigra *several have two and three chambers, and one has four.* The dikes established near these locks raise the water to a great height, and in particular the dike near the lock, of three chambers of St. Paul, supports a head of water 35 feet in height, and is one of the most remarkable hydrotechnical works in Europe. The river Vytaigra falls into the Onega lake, from which issues also the river Svive. In order to avoid the necessity of entering the lake, the Onega canal has been established, which, however, is not yet fully completed, for the entire distance between the mouth of the Vytaigra, and the inlet of the Svive.

Canal of Onega.—The construction of this canal was begun in 1818. The part completed is 12 miles and 3490 feet in length, and is 70 feet wide on the bottom, and eight feet deep. It extends from the mouth of the Vytaigra to the bay of the Onega lake, known as the Tchornay Pessok (black sand) bay. This part of the canal was opened for navigation in 1820.

The following circumstances have induced the establishment of this part of the Canal Onega. The Vytaigra river affords, from the city of that name to the Onega lake, with a moderate current, a channel everywhere sufficiently deep, but the mouth itself is liable, during north winds, to be obstructed with sand-bars, so that before the construction of the Onega canal, particularly in autumn, when the navigation is very active, the barks were obliged *to be towed by row-boats,* which involved very considerable expenses, and retarded the arrival of the cargoes at St. Petersburg. Besides this, the barks after clearing the river, had to turn a cape, which projected some miles into the lake, and which occasioned frequent shipwrecks. All these inconveniences are prevented by the establishment of the first part of the Onega canal.

At present the whole canal is almost finished, and it will probably be entirely so, and opened for navigation in 1852.

This second part of the canal, which was begun in 1820, after the completion of the first portion has been made for the purpose of shortening the time occupied in crossing the lake towards the outlet of the Svier, distant only 12 miles from the mouth of the Maigra, the channel of which has at all seasons a depth more than sufficient to admit the passage of barks with the heaviest loads. The distance from Rybinsk to St. Petersburg by the way of the Marie system, is 702 miles. The barks carrying loads of from 80 to 150 tons, make the trip under favorable circumstances in 40 or at most 45 days.

The canal of Bailo-Ozero has entirely removed the inconveniences encountered on the Marie system in consequence of the necessity of crossing the Bailo-Ozero lake; this system on account of the large dimensions of the barks which navigate it, the depth of the channel, and the certainty of passing through it in a fixed time, and finally, in consequence of the rapidity with which the trip is made, constitutes the best navigable communication between the Volga and the Baltic Sea.

Loaded boats at present only traverse this system in the direction towards St. Petersburg. About 1600 boats pass annually, carrying about 216,965 tons. The average cost of transportation from Rybinsk to St. Petersburg is $5·38 per ton.

By the three systems, which have just been described, viz: those of *Vishney Volotchock, of Tykvine, and of Marie,* vessels reach the Ladoga lake. For avoiding this lake three canals have been established, viz: those of *Svir, of Sias, and of Ladoga.*

Canals constructed for avoiding the Ladoga Lake.—The Svir canal is built between the mouths of the Svir and Sias rivers.

This canal was commenced in 1802, and opened for navigation in 1810.

Its level, as well as that of the Sias, *is the same as that of the Ladoga lake*, and there is, consequently, no necessity for locks.

Its length is 24 miles and 3655 feet, and its breadth on the bottom is from 63 to 105 feet. Boats can navigate it with a draft of water of about five feet. A steam dredging machine is employed for removing the deposits of earth which are formed in the Svive canal, and still more in the neighborhood of the mouths of those streams, and at the intersections of the Svive canal with the rivers of Voronona, Visika, and Pelgowka.

The end of the Sias canal, near the Volkhov river, is most exposed to the deposits, arising from the fact, that its direction is contrary to that of the current of that stream.

The Sias canal has been dug between the mouths of the Sias and Volkhov rivers.

The works were begun in 1764, and were, for various reasons, frequently interrupted. It was opened for navigation in 1802.

The level of the canal is that of the lake. Its depth corresponds to the varying height of the lake waters, so that when the lake is lowest

there is still depth enough for navigation. There is, consequently, *no necessity for locks*, and the only hydrotechnical works which are found on it, are the paths and the revetments of the banks. The canal is $6\frac{2}{3}$ miles long, and 70 feet wide on the bottom. Boats can navigate it with a draft of water of about five feet.

The canal of Ladoga is built between the mouth of the Volkhov river and the inlet of the Neva from Ladoga lake.

On the 22d of May, 1722, Peter the Great, surrounded by his ministers, generals, and senators, after having heard mass, was the first to take a shovel and begin the excavation of the Ladoga canal. He filled a wheelbarrow with earth three times, and wheeled it a considerable distance, and deposited it. The lords of the court all imitated the example of their august master.

The navigation of the canal was begun in 1731. It is $69\frac{1}{3}$ miles long, and from 70 to 98 feet wide on the bottom. It may be navigated by boats drawing five feet of water.

The canal has two arms or branches, one at its junction with the Neva, near the city of Schlusselburg, and the other at its junction with the Volkhov, near the city of Novaga Ladoga. The principal hydrotechnical works, are the locks built at each of its mouths, and seven waste weirs placed in the beds of the stream, which connect the canal with Ladoga lake.

The waste weirs keep the navigable level of the canal waters at a constant height, while those of the lake are subjected to periodical variations. It has been observed that the waters of the lake *rise during a period of seven years, and fall during as many more.* The variations in the lake level have not yet been determined exactly, but the greatest difference observed between the levels of the canal and of the lake is seven feet.

All these works have been built anew under the reign of his Imperial Majesty the Emperor Nicholas. The locks at the Neva end, and the waste weirs into the lake, are built of granite. At the Volkhov end, the locks are of brick masonry, wood being only employed for cornice, mitre, tills, &c.

The locks at the Volkhov end of the canal afford five passages for water at the same, two chambers being at the old mouth of the canal, and three at the new one. At the Neva end there are six openings, of which four are side by side at the old mouth of the canal, and two at the new one.

This augmentation of the means for passing the boats from the Ladoga canal into the Neva, has been induced by the difficulty which was experienced in the passage of boats by the old outlet of the canal into the Neva, when the wind was contrary. The mouth called the old one, at Vovaja Ladoga was established in 1761, that is to say, at a time whereof the number of systems, which at present connects the Baltic with the Caspian, only one was in existence, viz: that of Vishney Volochock, and when, consequently, all the boats which arrived at Vovaja Ladoga to take the Ladoga canal, descended the Volkhov river, from which the entrance of the boats into the locks of the old

mouth was very easy. The canal of Siass was afterwards built, forming a part of the navigable systems of Bykhvinka and Maurice. The mouth of the Siass canal at the Volkhov is below that of the Ladoga canal about two-thirds of a mile. To avoid the necessity of ascending with the canal boats against the stream, an operation which is very difficult when the wind is ahead, it has been found necessary to make a new mouth for the Ladoga canal, opposite to the point where the Siass canal enters the Volkhov.

The chambers of the locks at Schlusselburg at the new mouth, are 231 feet long, and 30 feet broad, and at the old mouth they are 175 feet long, and 30 feet broad. The chambers of the locks at the new mouth at Schlusselburg *have from four to six gates*, in order to permit the more speedy passage of small boats, such as those of the Tykhvine and Svimnki and passenger boats, and to economize water. The full length of the lock chambers is intended for floats of timber.

The Ladoga canal *is fed by means of reservoirs.* The place where the artificial reservoirs are constructed, is situated in a great morass, beginning near the city of Ladoga and ending at the Kubana river. This morass is bounded on one side by some high ground, on which passes the post road of Faroslav leading from Schlusselburg to Novaja Ladoga, and on the other by Ladoga lake. Lengthwise, this marsh is almost entirely level, but transversely it slopes towards Ladoga lake.

Before the Ladoga canal was built, the small streams flowing from the morass to the lake drained off the snow and rain water freely, but when the canal banks stopped this free flow, the water begun to accumulate in the low places, and these formed artificial lakes, which are the present reservoirs. Another sandy elevation, the Korovj Khraibet, divides this same morass in the direction of its length, into two parts, which are nearly equal. In this way the Korovj Khraibet is separated from the post road by the morass, and from the canal *by the reservoirs.*

Detailed researches into the actual condition of the reservoirs of the Ladoga canal have demonstrated: 1st, that the quantity of water which they contain, when up to their full level, as well as that in the contiguous morasses, whence they are supplied with water, estimated by means of formulas at the time of the flowing of the water over the waste weirs of the reservoirs, amounts to 1,680,700,000 cubic feet. 2d, the quantity of water which the reservoirs, properly so called, *contain, when full*, as before estimated by means of transverse profiles, amounts to 968,975,000 cubic feet. It follows from this, that the marshes contiguous to the reservoirs, when full, pour into the reservoirs a mass of water equal to 711,725,000 cubic feet, but during dry summers, the water contained in these vast morasses evaporates before the period when it is necessary to feed the canal by the water in reserve, and then, during the dry period, the marshes absorb the reserve water, and serve as conductors to a more rapid evaporation.

Admitting, from the result of experience, that in a dry time, *a layer of water two feet thick is evaporated*, there would still remain in the reservoirs about 51,450,000 cubic feet of water which may be used for the purposes of navigation.

In 1826, two steam engines were constructed for the purpose of supplying the canal with water by pumping it from the lake, *but it has not been found necessary to make use of them.* All the vessels proceeding to St. Petersburg by the three systems of Vishnii Volotchock, Tykhvine, and Marie, pass through the Ladoga canal. The weight of the cargoes transported to St. Petersburg by this canal, annually amounts to 4,098,213 tons. The weight of the cargoes sent from St. Petersburg to the interior by the Ladoga canal amounts to 19,286 tons. The number of boats of all descriptions, which pass through the canal, annually amounts on an average to 20,000.

Independently of the systems which have just been described, there are to be included among the number of the channels of artificial navigation having St. Petersburg as their centre, the following, viz: The Moscow Canal and the canal of the Duke Alexander of Wurtemburg.

The project of a water communication between the Tstra and the Sestra was prepared for the purpose of extending the navigable system of Tykhvine to Moscow, so as to furnish the means of accelerating of cargoes from St. Petersburg to the interior of Russia, and *vice versa*, and also, for the purpose of replacing by a commodious navigation, the transportation of merchandize by land, which annually takes place between Moscow and the landings of Rogatchev and Schocha (on the Volga), and also to facilitate the conveyance to Moscow of timbers and wood. The execution of this project was commenced in 1826.

The Canal of Junction between the Tstra and Sestra is 5⅓ miles long. It constitutes the summit level of the system. A reservoir has been here established having a superficial area of 1968 acres, and containing about 617,400,000 cubic feet of water. Assuming that about 300 boats pass through the canal loaded with 120,500 tons, the annual expense of water has been calculated to be 134,350,000 cubic feet, and according to observations made for several consecutive years, *this quantity of water is every year renewed in the reservoir.* In case the navigation on these two rivers should exceed the estimated amount, it is proposed to augment the supply into the reservoir, by conducting to it the water of the river Khazina, and those of the lake Tiastenskoidi, which is not far from the summit.

The new navigable route is from Moscow to the Volga, 182⅔ miles long, in which distance are included 43⅓ miles of the upper part of the Moskwa river, 57 miles of the course of the Tstra, 8⅔ miles of canal along the banks of Tstra, the summit canal 5⅓ miles long, 41⅔ miles of canal along the banks of the Sestra, and finally, 20 miles of the course of the Sestra, and 6⅔ miles of that of Donbna.

The locks are of brick masonry *covered in some places with cast iron plates;* of these there are two on the Donbna, twenty-four on the Sestra and the canal along its banks, eighteen on the Tstra, and five on the Moskwa.

The dimensions of these locks are the same as those of the locks of the Tykhvine system, that is to say: 91 feet long and 15 feet wide. It is proposed, however, to make the two locks at the extremities of the system, that is to say, of a lock on the Donbna, on one of the

canals which circumscribes Moscow, of larger dimensions, in order that the larger arks which navigate the Volga between Tver and Rybinsk, and those on the lower port of the Moscowa, between Moscow and Rolumna, may pass through these locks and discharge their cargoes at the landing established above them, so that they may be carried further by the Tstra and Sestra.

For this purpose the Donbna lock has been made 154 feet long and 30 feet wide, in order that the barks of the Volga may pass it, and that of the canal around Moscow has been made 210 feet long and 42 feet wide, so as to conform to the dimensions of the arks, which navigate the Moskva river. This lock, called Kvasnoi Kholm, has two chambers, the total lift being 12½ feet, which is the difference of level between the canal of circumference and the Moscow river at its low stage.

In this way the canal around Moscow, dug from one part of the river to the other through a marshy flat, serves as a junction between the navigation of the Sestra, Tstra, and the upper part of the Moskva, and that coming from the Oka, and traversing the lower part of the Moskva, which formerly terminated at the stone bridge near the Kremlin.

The cost of establishing the new water communication between the Volga and the Moskva, including that of constructing the locks on the upper part of the Moskva, and the canal around the city of Moscow is $3,000,000. In the sequel this project having undergone important modifications, the works have been stopped, and at present a new project is being prepared for this important route.

The canal of the Duke Alexander of Wurtemburg is built between the Scheksna, which forms part of the system of Marie and lake Kubinsk, from which issues the Sukhona, a tributary of the northern Dwina.

This canal was commenced in 1823, and opened for navigation in 1828.

It leaves the Scheksna at a point 6⅔ miles from the city of Risilof, and passing through the lakes Siversk, Babyai Zavnlomsk, Vasirinsk, Lirhemsk, and Blazvoraistchensk, terminates at the river Porosovitza, which falls into the lake Rombensk.

The different sections of canal have together a length of about 10⅔ miles, and the distances through the different lakes make in all about 8⅔ miles.

Two small rivers, which serve to join some of these lakes, and the Porosovitza river taken together, have a length of about 26⅔ miles.

Thus the entire artificial system of the canal of the Duke Alexander of Wurtemburg is about 46 miles long.

The summit level, or dividing point of this system of navigation, is the lake Vasirinsk.

From this the other lakes are stretched out both on the side of the Scheksna, and on that of the Porosovitza.

The passage from one lake to another, and that into the Scheksna, as well as the navigation on the Porosovitza, are effected by means of locks. These locks *are of wood*, with dimensions similar to those of the locks of the systems of Marie.

The boats or arks which navigate this canal, carry about 150 tons. They draw about four feet of water, and are 84 feet long and 28 feet broad.

Although the canal of the Duke Alexander of Wurtemburg has not upon it so active a trade as the other systems of navigation, nevertheless it now passes 130 boats going towards the Scheksna river, and 50 going towards the Rombensk lake. The cargoes going towards the Scheksna, each season, amounts to about 13,000 tons, and those going towards the Rombensk lake to 1000 tons.

(To be Continued.)

For the Journal of the Franklin Institute.

On the Efficiency of the Steam Casing or Steam Jacket in Steam Engines. By Gordon McKay, Esq.

The importance which the steam engine has assumed in the industrial affairs of the world, its universal use, the amount of money daily expended in keeping its strong arm in motion, and the extent to which it affects the interests of every member of society, render any investigation of its principles, whereby new features are developed, or old, and partially neglected ones resuscitated, and shown to be valuable, of importance sufficient to excuse me for seeking a space in the pages of your valuable *Journal*, to lay before the public the results of some experiments, made with the view of testing the efficiency of the "steam casing," or "steam jacket," on the cylinder of the steam engine.

I was led to these inquiries by noticing the almost universal neglect of this principle, in this country, particularly in non-condensing engines, and by the equally universal application of it to the Cornish condensing engines in England, where the highest economical results have been attained, and this question suggested itself. Is the steam jacket economically applicable only to the condensing engine?

It may be well here to describe what the steam jacket is. Although the history of the steam engine, and its various parts, have now become almost as familiar as household words to the engineer, there may be some who will read this article, by whom the term is not understood. The "steam jacket" was an invention of Watt's, and forms the first claim in his patent of 1769, the principles of which he describes in the following words: "First, that vessel in which the powers of steam are to be employed to work the engine, which is called the cylinder in common fire engines, and which I call the steam vessel, must, during the whole time the engine is at work, be kept as hot as the steam that enters it. First, by enclosing it in a case of wood or any other materials that transmit heat slowly. Secondly, *by surrounding it with steam or other heated bodies, &c.*" This he did by making the cylinder of his engines double, or one cylinder within another, the space between them being filled with steam taken from the boiler, and having its full pressure and consequent temperature. The outside cylinder was encased with wood, or other non-conducting substance, to prevent loss of steam in the jacket.

There are many engineers of high standing, who deny the efficacy of the steam jacket, and consider protecting the cylinder by non-conductors, as the utmost limit to which it is possible to carry economy in this direction; and they argue with some plausibility, that the cylinder will require just as much steam to keep it at a certain temperature if heated from the outside by a jacket, as it will if heated by the steam used in the cylinder to propel the machinery, while the jacket, necessarily having a greater radiating surface, will radiate more heat externally, and hence prove a positive injury. To ascertain the economy of the steam jacket, to what extent it is economical, and for what reason it is so, was the object of my experiments.

With this view, I had a small steam engine and boiler made. The boiler was a vertical one, about two feet in diameter, and six feet high, having an internal fire box and tubes. The engine was attached to the boiler, the cylinder being at its upper end, and placed above the water line in the boiler; and the shaft and balance wheel below. The valve is what is known as the lap valve, so arranged as to cut off the steam at one-half stroke. The cylinder was two inches in diameter, and the stroke eight inches; it was jacketed, and steam conveyed from the boiler to the jacket by a pipe, and the water condensed in the jacket, carried back to the boiler by another pipe, discharging below the water line into the boiler. Cocks were so arranged in these pipes that the steam could be cut off from the jacket altogether, or be admitted to it, and the condensed water returned to the boiler, or be taken from the jacket in a vessel and not returned to the boiler.

A dynamometer was applied to the balance wheel to measure the power, and a counter attached to the engine shaft to record its revolutions. A glass water gauge indicated the height of the water in the boiler, and a graduated scale on the gauge, the weight of water that the boiler contained. This scale was adapted to the expanded state of water at a temperature of 342°. The reservoir which supplied the force pump, was placed on a platform scale, and the water taken from it to the boiler carefully weighed. The boiler had also a steam pressure gauge, and during the experiments, the pressure was maintained at 115 pounds with great accuracy. The exhaust steam of the engine was used to make the draft, which was regulated by a closely fitting door in the ash pit, by adjusting which, the steam pressure could be regulated with great facility, a variation of one pound either way from 115, would cover the errors arising from that source. The cylinder of the engine was encased outside the steam jacket, with cotton about four inches thick; and during the experiments the safety valve was not allowed to lift.

The engine, when completed, was kept in motion for about fourteen days, in order to get it in such a state that its friction and leakage would remain constant during the experiments; and care was taken that the oiling should be alike in each case.

The first experiment was made with steam in the jacket, the condensed water being returned to the boiler.

The pressure on the boiler was . .	115 pounds.
The initial pressure in the cylinder was . .	95 "

(This was obtained by indicator diagram).

The weight on the dynamometer scale, $7\frac{1}{2}$ pounds, corresponding to about 1 horse power.

The duration of the experiment, . .	8 hours.
The revolutions made, . .	97,440
The water evaporated from the boiler, .	485 pounds.

By a subsequent experiment, the water returned to the boiler from the jacket, was ascertained to have been 15·7 pounds for the 97,440 revolutions. Making the whole water evaporated, 500·7 pounds.

The second experiment, without steam in the jacket, was continued eight hours, but the number of revolutions was a little less than in the first case, and the results as to water evaporated, have been corrected to correspond with the number of revolutions in the first experiment, to facilitate comparison.

The initial and boiler pressures, the same as before.

Weight on dynamometer the same.	
Duration of experiment, . . .	8 hours.
Revolutions (corrected), . .	97,440
Water evaporated, . .	630 pounds.

These experiments were then repeated with sensibly the same results.

From a measurement of the size of the steam ports, clearance, and fill, of the cylinder, a computation of water (as steam) required to supply the engine for 97,440 revolutions, with 95 pounds pressure, gives 321 pounds. Hence, in the first experiment we have the following:

Revolutions, . . .		97,440
Initial pressure, . . .		95 pounds.
Boiler " . . .		115 "
Water used in the engine, as computed, .	321	
" condensed in the jacket, . .	15·7	
" used in leaks of joints, boiler, &c.,	164·0	
Total water evaporated, .		500·7 "

In the second experiment (without jacket), we have,

Revolutions, . . .		97,440
Initial pressure, ...		95
Boiler "		115
Water used in leaks of joints as before,	164	
" used in the engine, . .	466	
Total water evaporated,	630 pounds.	

From the above it is evident that the water used in the engine and jacket was . .	321+15·7=336·7	"
While in the second, without jacket, the water used was .	466	"
Showing a saving by the jacket of . .	129.3	"
Or if the leaks be added, the result is the same,	336·7+164=500·7	"
	466·0+164=630·0	"
Difference, . . .	129·3	"

I think this result clearly shows the jacket to be economical, and in this instance the economy amounts to a saving of 129 in 466 of the

necessary quantity of steam, if there had been no leaks; or of 129 in 630, with leaks to the extent of the present case, or about 27 per cent. without leaks, and about 20 per cent. with leaks.

The question now arises, will this ratio hold good in all cases, and upon what principles is the saving by use of the jacket, or rather the waste (condensation), for the want of one to be computed.

Let us trace the action of steam through one revolution of the engine. The valve is opened, at the commencement of the stroke, and steam enters the port, and space between the cylinder head and the piston; all the surfaces surrounding these spaces are at a lower temperature than the steam, and a portion of it is condensed by imparting its heat to the surrounding surfaces. The piston now begins to move, and as it passes onward exposes new condensing surface to the steam, and more is condensed, and this process continues until the cut-off valve closes, and expansion of steam commences in the cylinder. At this point the cylinder is to a certain extent, in the same condition as the boiler, containing steam and water, and as the piston advances and the pressure is decreased, the water in the cylinder is again converted into steam, and thus if the expansion is continued long enough, the whole condensed water is re-evaporated. The exhaust valve now opens, and the return stroke of the piston is made, with a temperature of steam corresponding to the exhaust pressure. From these considerations, I think it evident that condensation will be as the *extent of condensing surface up to the point of cut-off, and as the number of revolutions*, it will also doubtless be effectual by the difference of initial, final, and exhaust temperatures. Precisely what effect these temperatures will have, I am at present unable to state, my experiments extending only to pressures as stated before.

The steam condensed in the cylinder of a steam engine, has been heretofore stated as a certain per cent. of the steam used, and attempts have been made to ascertain that per cent. for different degrees of expansion; but it is evident that if the condensation depends upon the condensing surface, no per centage of the steam used can be given which will apply to cylinders of all sizes; as the ratio of condensing surface, to the capacity of the cylinder, will vary in almost every engine. Let the condensation then be computed per square inch per stroke, and in the present instance it will be found thus: The whole condensation is given as 129·3 pounds, or 3581 cubic inches, which divided by the number of strokes, 194,880, is ·01837, this divided by the square inches of condensing surface which was rendered non-condensing by steam in the jacket, 23·55, gives the quantity as ·00078 cubic inches of water condensed by each square inch of unjacketed surface in the cylinder at any stroke of the piston; and this may be considered as correct for engines having initial and exhaust pressures corresponding to the one experimented upon, viz: initial, 95 pounds, and exhaust 17 above a vacuum.

In addition to the above method of ascertaining the condensation, I have obtained nearly the same result from a locomotive, where I had an indicator diagram taken with nearly the same initial, and exhaust

pressures, and where the condensing area, and dimensions of the cylinder were known. The excess of water in the state of steam in the cylinder at the end of the stroke, above that at the point of cut-off, as shown by the steam pressures at these points, amounted to ·0008 cubic inches per square inch of condensing surface; a quantity a little greater than that obtained in the experiment, yet so near as to be corroborative. It may here be remarked, as illustrating the truth of the assertion, that the condensation is as the surface and as the strokes, and not a per cent. of the quantity of the steam used, that the ratio of condensing surface to the contents of the cylinder, was in the experimental engine, as 14 to 35, while in the locomotive it was as 16 to 12 and the revolutions as 200 to 168.

The next inquiry that suggests itself is, how can this saving in the use of the jacket be accounted for? I think the answer will be found in the fact, that if heat be taken from the steam inside the cylinder to maintain its temperature, the only heat that is available for that purpose, is the sensible heat, that is, the difference of the temperatures due to the initial, and final pressures; or in the experiment cited before 328°—220° = 108°, 328° being the temperature of steam at 95 pounds pressure, and 220° that of steam at 17 pounds pressure. It may at first seem that the latent heat is applied to heating the cylinder, inasmuch as the steam is in part condensed, as shown by the diagram of the locomotive cylinder, and therefore its latent heat must be evolved. But it also seems from the locomotive diagram, that the same water was reconverted into steam, thereby resuming its latent heat, hence the sensible heat is all that remains in the cylinder. While if the steam is used in the jacket, the latent heat is applied to the cylinder, and this amounts in the present instance to 1202°—342° = 860°, 1202° being the total heat in the steam, and 342° the temperature of the water that was returned to the boiler from the jacket. If this solution of the question is correct, the product of the condensed water inside the cylinder, multiplied into the temperature assigned to it, should equal that of the water in the jacket, multiplied into its temperature, or $129{\cdot}3 \times 108° = 13{,}964$, which should equal $15{\cdot}7 \times 860° = 13{,}502$.

The result is not exact, but sufficiently so to induce considerable confidence in the theory.

The preceding experiments and deductions are not by any means sufficient to enable me to determine fully the laws which govern the condensation of steam in a cylinder, they only fix one point for one degree of expansion, and one final and initial temperature, and in order to a full investigation of this interesting subject, more extensive experiments are necessary. They are however sufficient to show that the steam jacket is not a mythe, but has a real value which can be accounted for on sound principles, and also that it is advantageously applicable to non-condensing as well as to condensing engines.

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REMARKS.—*Hirn's Experiments on the Steam Jacket.*

The interesting communication of our correspondent, reminds us that we have had lying upon our table for some months, a long memoir

upon the subject of the steam jacket, communicated to the Industrial Society of Mulhouse, by G. A. Hirn, and read before that Society, on 25th April, 1855.

The experiments of M. Hirn were tried upon an engine of Woolf's construction (double cylinder with expansion and condensation), and each experiment lasted a day. The machine, with its jacket in action, with a pressure of 3·75 atmospheres in the smaller cylinder, gave 104 horse power; when the jacket was not used, with the same pressure, and all other circumstances the same, it gave 79·5 horse power; showing a gain of 23·5 per cent., which agrees very well with the results of our correspondent.

We propose, when we can find leisure, to condense the very valuable memoir of M. Hirn for our readers. In the mean time we give his conclusions.

1. The steam jacket produces a saving of power of 23·5 per cent. in a condensing and expanding engine.

2. The jacket does not act by avoiding the external loss of heat.

3. It owes but a small part of its useful effect to its power of drying the steam.

4. It owes but a small part of its useful effect to the excess of expansion of the vapor (acting as a gas), from the greater heat of the walls of the cylinder.

5. When saturated steam expands without additional heat, it is partially condensed; *and the prevention of this condensation is the origin of the economy of the steam jacket.*

6. The actual economy of fuel produced by the steam jacket is but 22·2 per cent., and not 23·5 per cent., as was deduced from the comparison of the powers.

7. No other practical means has yet been found to replace the action of the steam jacket.

He recommends as secondary means of increasing the useful effect of the engine:

First, to surround the steam jacket with the smoke flue, as suggested by M. Dollfus; and

Secondly, to keep always the steam in the boiler, and consequently that in the jacket, at the highest pressure possible.

On an Improved Construction of Axle-boxes and Coupling-rods for Locomotive Engines. By Mr. William A. Fairbairn.*

[Read before the Institution of Mechanical Engineers.]

This construction of axle-box has for its object the introduction of an elastic cushion or spring of vulcanized india rubber between the axle-boxes and framing of locomotive engines, for the purpose of allowing the wheels to accommodate themselves to curved portions of the railway, and thus to diminish the wear on the flanches of the wheels and on the faces of the axle-boxes. The india rubber spring is placed in recesses formed in the jaws of the horn plates upon each side of the axle-box, and a metal plate, with a smooth case-hardened surface, is

*From Newton's London Journal of Arts, February, 1859.

interposed, upon which the axle-box slides vertically with the inequalities of the road. The force of the spring-action of the india rubber is made sufficient to keep the axles of the wheels at right angles to the straight portions of the railway, but to yield to the friction of the rails upon the wheels in curved portions, and by this means to allow the axles to assume such a position as will place the wheels at a tangent to the curve. The elasticity of the india rubber serves also to keep the axle boxes at all times in close contact with the faces of the horn blocks, so as to secure a good fit, and obviate the necessity for that constant lining which they ordinarily require, in consequence of the wearing away of the working faces.

That the leading and trailing wheels may have still further flexibilty of adjustment, a small play is permitted to the axle-box laterally, in the direction of the axle, by making the recesses in the axle-box, which receive the face-plates, wider than the plates themselves by $\frac{1}{2}$-inch. But to keep the axle-boxes in position in straight portions of the road, these plates are made wedge-shaped in plan, so that the elastic pressure of the india rubber on the face-plates restores the axle-boxes to their central position, whenever the pressure on the flanches of the wheel is relieved. The inclination of the wedge is made such that $\frac{1}{4}$-inch movement of the axle-box laterally, in either direction, compresses the india-rubber $\frac{1}{8}$-inch.

The india rubber is employed in the form of rings or washers $\frac{13}{16}$-inch thick; and it is found convenient, in order to maintain an accurate fit between the working surfaces of the axle-boxes, that these washers, when in position, should be compressed $\frac{3}{16}$-inch, which is equivalent to a pressure of about 1 ton on each side of the axle-box, tending to maintain the contact of the working surfaces. With this pressure, the axle-boxes slide more freely on the case-hardened surface of the plates, than in the usual construction; whilst the motion which permits the wheels to accommodate themselves to the curvature of the road does not in the least increase the oscillation of the engine, and prevents the excessive wear of the shoulders of the journals and the flanches of the wheels, which are such fertile causes of unsteadiness in ordinary engines.

In the case of the driving-wheels of the engine, it is not advisable to allow so much play to the axle-boxes; and hence, whilst the admirable fit between the working surfaces obtained by the above arrangement renders its employment advantageous, it is modified in this case by the use of a band of india rubber, $12\frac{1}{2}$ by $2\frac{1}{2}$ inches, and $\frac{3}{8}$-inch thick, covered by a wrought iron plate, case-hardened as before, but not wedge-shaped, since in this case all lateral play is to be avoided. A longitudinal play of $\frac{1}{32}$-inch only is allowed on each side, between the case-hardened plate and the horn-blocks, to permit the action of the india rubber spring, which is compressed in this case, so as to exert an initial pressure of about 15 tons on each side of the axle-box, to resist the action of the force driving the engine. Notwithstanding this large pressure on the working faces of the box, it is found, in practice, to fall readily with the weight of the wheel itself. In the case of the driving-wheel, the advantage derived by this construction does not

consist in the adjustment given to the wheels, but in the perfect fit at all times maintained between the sliding surfaces; the elasticity of the india rubber also forms an elastic cushion to receive the shocks of the machinery. A small strip of leather prevents the oil from gaining admission to the india rubber. The perfect freedom of motion, the small wear of the axle-box, in consequence of the case-hardening of the slides, the ease with which the engine passes curves, and the diminished wear of the wheel-flanches, are important advantages, which have been derived, in practice, from this construction of axle-box.

A similar application of an india rubber spring to the outside coupling-rods of an engine had also been made. In this construction of rods, the use of cotters for tightening the brasses was dispensed with, by employing a set-screw at the end of the rod, secured by a lock nut, from risk of working loose.

Mr. W. Fairbairn showed a specimen of the india-rubber lining from an axle-box that had run 17,000 miles in a locomotive engine; also, a model of the axle-box fitted up with india rubber, and a specimen of one of the connecting-rod ends. He stated that it was requisite to take great care to keep oil away from the india-rubber; as in one trial, the india rubber had lasted only a month, from neglect of this precaution; but when properly protected from oil, its durability was found to be very great. A cap was now fixed over the india rubber, as a more complete protection for this purpose. These axle-boxes and connecting-rods were working in several locomotives on the Chester and Birkinhead Railway, and they were found to be now as good and perfect as when first put in, though some had run as much as 17,000 miles; they were considered quite satisfactory, and the result of the axle-boxes was an improvement in reducing the wear of the wheel flanches. The connecting rods were screwed up at the ends, instead of being cottered as in the usual manner; and this mode of construction he considered an improvement as regarded convenience and security from accident.

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*Description of an Improved Railway Switch.** By Mr. John A. Haswell.

[Read before the Institution of Mechanical Engineers.]

In the various kinds of switches now used on railways, the moving tongue slides upon the chairs, rubbing upon them throughout the extent of its motion; and the switches are made self-acting by a balance weight, hanging from the lever, and constantly pressing the tongue home to the side of the main rail. But in practice this plan is found defective; for although a weight is employed as heavy as can be conveniently worked, its action is uncertain,—being frequently impeded by the friction of the sliding tongue, from the chairs having become dry, or the oil becoming adhesive or mixed with sand and ashes. The tongue-rails are then liable to remain on the wrong side, or only partially reversed,—thus presenting both tongues open, and causing danger of accident, from wheels running off the rails, by the flanches

* From Newton's London Journal of Arts, February, 1859.

entering between the tongues and main rails at both sides. To lessen this defect, a raised strip has been used upon the rubbing part of the chairs, which reduces the surface for holding sand; but this plan involves the objection of the oil being sooner rubbed off by the motion of the tongue, from the increased pressure between the rubbing surfaces. The large consumption of oil that takes place with the ordinary switches, forms a serious item of expense,—most of the oil that is applied being unavoidably wasted.

The new construction of switches described in the following paper, which is the invention of Mr. Edwin Thompson and Mr. William Nicholson, of York, is designed to remove this difficulty, by avoiding the sliding of the tongue-rails upon the chairs, and so dispensing entirely with the use of lubrication.

The tongues are of the ordinary form; but a short iron strut or link is jointed to the thin end of each tongue-rail and to the end chair, so that, when the tongue-rail is opening, this strut causes the end of the tongue to rise off the chairs, and the other tongue at the same time descends upon the chairs,—the short strut acting as a radius link. The elevation of the tongue-rail, when open, is two inches above the level of the main rails, which is found to insure the tongue-rail being properly put down upon the chairs, and closed to the main rail, and being also entirely clear from any low portions of the engines, &c.

In this construction of switches, on account of the sliding motion and friction of the tongue-rails being entirely avoided, oil is not required, and no danger can arise from sand or ashes lodging on the chairs; also, the removal of any larger fragments of coke or ballast is, to a certain extent, provided for by the altered form of the chairs, which this manner of opening the tongue-rails admits of. As the tongue-rails require no larger surface to rest upon than is actually in contact with the chairs, when they are closed to the main rail, advantage is taken of this by increasing the thickness of the chairs at the particular part upon which the rails rest, forming a raised step, which is completely covered when the tongue-rail is closed; and on the open side, the width of the tongue-rail only is exposed to the reception of rubbish,—the larger pieces thus falling off, and the smaller ones being crushed or removed by the descent of the tongue. The accomplishment of this object has been satisfactorily shown by the working of one of these switches, which has been put down in a situation where sand was constantly used for the engine-wheels, and has continued to work well, although sometimes nearly buried by the accumulation of sand.

In these switches, the ends of the tongue-rails are extended a foot beyond the sharp edge that fits against the top of the main rail; and the extended ends are curved inwards, like a check-rail end, and reduced in height $1\frac{1}{4}$ inch, to allow the wheel-flanches to pass over the top, when the tongue rail is closed to the main rail; and in any case of the tongue not being properly closed, the pressure of the wheel-flanch will tend to crush any obstructing substance upon the chairs. This action is aided by the check-rail end of the tongue on the opposite side, which in such a case will not be opened to the full extent, but

sufficiently so to guide the wheel-flanches in the proper course, and, by drawing them from the other imperfectly-closed side, prevent the wheels from taking both lines.

Some of these switches are now in constant use at the York and Newcastle stations, where they can be seen in operation.

Mr. J. A. Haswell exhibited a large working model of the new switch. Mr. J. Bourne had had one of the switches in operation at the Newcastle station for a month, and some others had been tried for about six months at the York station. These had been working very satisfactorily, and were found to have a decided advantage over the other switches in use. The others required constant oiling and attention to keep them in working order; and the oil, collecting the dust and grit, caused frequent cleaning to be necessary, to prevent risk of accident, from the switch sticking partly open. In winter, great difficulty was experienced with ordinary switches from the snow, which partially melted in the day-time, and then froze again in the evening,—causing the switch-tongue to be choked up by ice, and prevented from shutting close; and the men had to be continually using salt, to thaw the ice and keep the switches working. But these new switches were completely free from those defects, and appeared very successful in meeting the requirements of self-acting switches. No oil was used, and this effected an important saving in annual expense; and from the switch-tongues not having any sliding motion on the chairs, no inconvenience was experienced from sand and dust; and the risk of their sticking partly open was effectually prevented, as they must fall on one side or the other.

For the Journal of the Franklin Institute.

Papers on Bridge Construction. By John W. Murphy, Civ. Eng. Philadelphia, Pennsylvania.

(Continued from page 147.)

The Arch.—In the construction of arch bridges, some definite line is assumed for the *intrado*—and some other definite line also assumed for the *extrado*.

These lines are dependant upon either the taste of the engineer, or upon some necessity. In some cases it may be imperative that the *extrado* shall be a horizontal line, while the *intrado* may be any curve, according to taste. Sometimes imperative that the *intrado* shall be of that character such as will give the greatest possible area of *water-way*, at others, so that the greatest architectural effect may be produced upon the eye.

In all cases where these lines are fixed agreeably to the judgment, foresight, and discretion of the engineer, the weight of the superstructure may be approximately determined. It then only remains to give such dimensions to the *ring-stones* or *ribs*, to cut their joints in such direction as shall best satisfy the conditions of the line of *resultant pressures*.

This line requires but two conditions of satisfaction for stability, and no more.

One condition is—*That it shall be embraced or contained within the arch-stones or rib, of which the arch consists.*

The other: that it shall meet the joints of the same at a greater angle than the angle of friction of the material of which the arch is constructed.

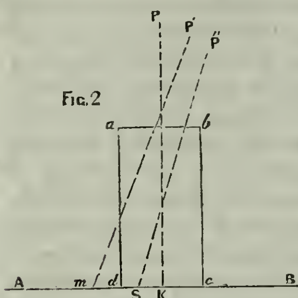

Fig. 2

Suppose a block of granite *a b c d*, (Fig. 2,) be seated upon a plane, A B, of the same material. Let it be acted upon by a force P, in a direction parallel to the side *a d*, and perpendicular to the plane A B. It is clear that the mass *a b c d*, will have no tendency to move, but will remain in position, unless the force P, be so great that it overcomes the cohesion of the particles of the granite, when it will crush the mass.

Suppose again, that the force P, be transferred to P′, taking the direction P′ *m*, and falling without the base of the granite block; it is clear that this force will have a tendency to overturn the block about the point *d*. And again, if it be transferred to P″, taking the direction P″ S, the body *a b c d*, will have a tendency to slide upon the plane A B, in the direction toward A, and will be resisted by the friction of the surface of the granite block upon the granite surface A B. If the angle P″ S B, be greater than the angle of friction of the material, the block will remain stationary. If less, it will move toward A. This angle in practice should never be less than 30°.

Now if we suppose that the block *a b c d*, be a portion of the *ring-stone* or rib of an arch, and that the forces P, P′, P″, are the *resultant pressures*, we readily discover the truth of the statement that this line of resultant pressure, through the supporting medium of the arch, requires but two conditions of satisfaction, and no more—and hence the point to be gained in the construction of arch bridges without counterbracing, is to so arrange the weights or masses of matter, as that this resultant line shall be as near as possible at right angles to the joints. Or finding this to be impossible, to change the direction of the joints to conform to the line; or finding this also to be impossible, make the ring parts so deep, that these two conditions may be as nearly as possible fulfilled.

If the resultant pressure upon any single section of the arch, such as *a b c d*, due to the superincumbent weight above it, take the direction as shown, either in the direction P, P′, or P″, we shall have our arch the most stable possible, when that force takes the direction P, at right angles to the joint.

Failure will take place when the resultant pressure takes the direction P′, falling entirely without the ring-stone or rib, and stability or non-stability when the force P″ makes a greater angle with that joint than 30 degrees, or thereabouts.

We now arrive at the determination of the constant value of h, in Equation (2), page 147.

Let $a\ b\ c\ d, \ldots g$, be the intrado of any arch, and A B C D, . . H, be the extrado. Now since it is conditioned, (by what has already been proved,) that the weight at b and f, shall have such relation to the weight at c and e, as that the horizontal thrust $= h$ shall be the same at either point.

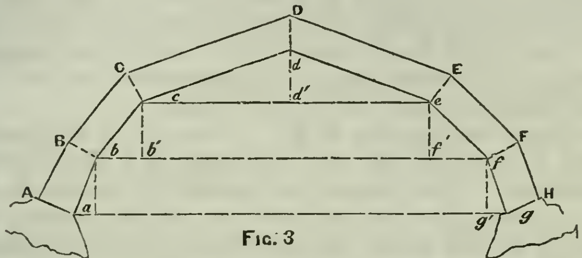

Fig. 3

It follows that the weight at the point d, which acts through the two braces, (so to express it), $d\ c \ldots d\ e$, shall have such a horizontal value that the points c and e shall be maintained in equilibrium by the equivalent horizontal thrust due to the value of the vertical weight at the point c and e.

In other words, suppose that the mass of matter in the stone A B, $b\ a$, be supposed to be concentrated at the point b, and in the same manner the mass of matter of f, F, H, g, be accumulated in the point f, and that in each instance, through the line $a\ b$, and $f\ g$.

Relieve the points b and f, from the weight of the superincumbent masses above them, and they will fall inward in the direction of the lines $b\ b'$, $f\ f'$.

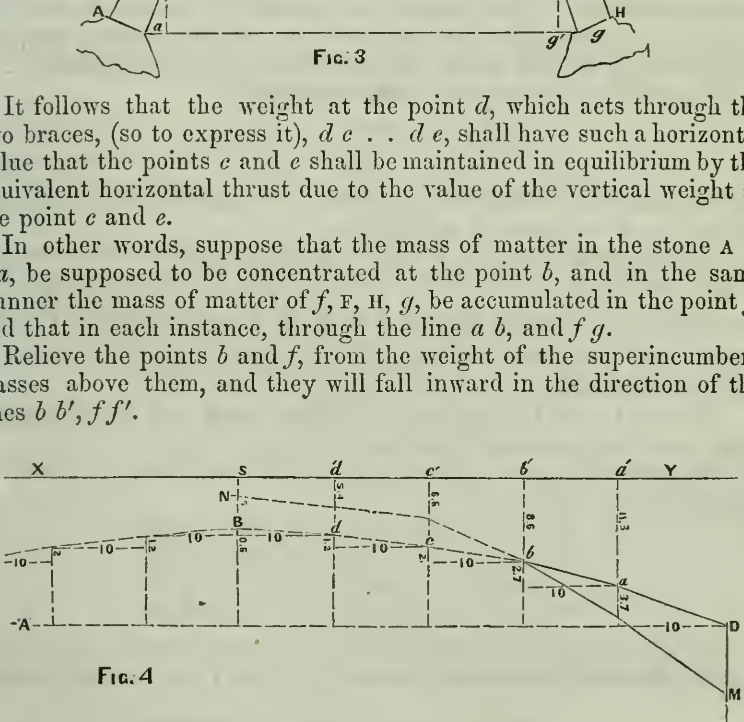

Fig. 4

Put such value to the weight at c and e as will have a horizontal thrust equal to the tendency of the two masses (accumulated at b and f), to press inward, and the points b and f remain in equilibrio.

In the same manner, let the value of the vertical weight acting at d, in the direction $d\ c$ and $d\ e$, have a horizontal component, at c and e, which must also equal that at b and f, equivalent to the horizontal value of the weight acting at the points c and b, e and f. Now the weight

acting at b, to produce h, is made up of b, c, d, and the weight acting at c, is made up of the weight c, d. And the weight acting at d, in the direction d, c, to produce h, is in fact,—The *horizontal component of the weight at the crown of the arch.*

Applying these principles to practice:

Suppose it be required to find the dimensions of the ring-stones of a proposed arch bridge, to be constructed in stone masonry.

It is decided that the span shall be 100 feet in the clear, and the rise (or versed line) 10 feet; the intrado to be the arc of a circle.

Let A, B, D, Fig. 4, be the curve of the intrado, and suppose X, Y, be the extrado or roadway, which is made parallel to A, D.

Let the distance B, S, at the crown = 5 feet.

From whence the distances d' d, . . c' c, &c., of the spandrel are determined, as shown in the cut. The value of b, Equation (2) being taken at 10 feet. If we suppose the masonry of the arch to be of the same density throughout, we shall have the weights resting upon the ring, varying directly as the dimensions marked in the spandrel.

Re-producing Equation (2) from page 147.

$$a = \frac{(\text{K}' + \text{W}' + \text{V}' \ . \ . \ . + \text{N}')}{h} b.$$

We have first to determine the value of h, putting the weight per cubic foot of our masonry at 170 lbs.

And, supposing that the weight impinging upon the crown, and acting in the direction toward the point D, shall be measured by 5 feet in height by 5 feet in length, $\left(\text{or } \frac{10}{2}\right)$ also multiplied by 170 lbs., which will be sufficiently near for all practical purposes—we have $5 \times 5 \times 170 = 4250$.

$4250 : h :: 0{\cdot}6 : 10$, or $h = 70{\cdot}833$ lbs., which will be the pressure upon the ring-stone at the crown.

The vertical weight in lbs. upon each of the points d, c, b, a, will be as follows, viz:—

$$\begin{aligned}
\text{at } d &= 5{\cdot}4 \times 10 \times 170 + 4{,}250 = 13{,}430 \\
\text{“ } c &= 6{\cdot}6 \times 10 \times 170 + 13{,}430 = 24{,}650 \\
\text{“ } b &= 8{\cdot}6 \times 10 \times 170 + 24{,}650 = 39{,}270 \\
\text{“ } a &= 11{\cdot}3 \times 10 \times 170 + 39{,}270 = 58{,}480
\end{aligned}$$

By substituting in Equation (2), the above calculated value for the sum of the weights as above indicated by $\text{K}' + \text{W}'$, &c., we shall have for,

$$\text{Value of } a, \text{ at } d = \frac{13{,}430}{70{,}833} \times 10 = 1{\cdot}88$$

$$\text{“ \quad “ } \quad c = \frac{24{,}650}{70{,}833} \times 10 = 3{\cdot}48$$

$$\text{“ \quad “ } \quad b = \frac{39{,}270}{70{,}833} \times 10 = 5{\cdot}50$$

$$\text{“ \quad “ } \quad a = \frac{58{,}480}{70{,}833} \times 10 = 8{\cdot}20$$

Describing the curve from a point, N, 3 feet above the line of the intrado at the crown, and passing it to M, by the data above calculated, we obtain its direction independent of the direction in which the ring-stones should be jointed, and also independent of the number of ring-stones, or rather we should say, the line has been determined upon the supposition that the joints are vertical, and that the ring-stones have a depth of ten feet. I have taken this method of progression, in order that we might arrive more clearly to the determination of these joints, and thus show by what simple changes this line is made to pass above the intrado from B, to D, and thus fulfil the requisites of stability.

(To be Continued.)

AMERICAN PATENTS.

LIST OF AMERICAN PATENTS WHICH ISSUED FROM JANUARY 18, TO FEBRUARY 15, 1859, (INCLUSIVE,) WITH EXEMPLIFICATIONS.

JANUARY 18.

136. POTATO DIGGERS; R. L. Allen, City of New York.

Claim—The arrangement and combination of the removable wings with the double mould-board. Also, the arrangement and combination of the central or dividing bar with the standard, by means of the notched fastening, as set forth.

137. RING LOCK; Wm. J. Alston, Williamson County, Tennessee.

Claim—The friction springs, arranged in combination with the inner rings of the locks.

138. APPARATUS FOR DRYING GRAIN, MALT, &c.; Stephen R. Andres, Troy, New York, and Samuel Andres and McDonough Bucklin, City of New York.

Claim—The use or employment of a blast or current of hot air introduced into the cylinder through a hollow journal, or its equivalent, when said current of hot air is brought into direct contact with the substance to be dried thereby, in combination with a cylinder made adjustable to any angle.

139. SYRINGING APPARATUS; Ernst Bagniki, City of New York.

Claim—The construction of a chair containing a pump, with an arrangement of the valve chambers, in the manner specified.

140. AMALGAMATOR; John and Edward W. Barker, Baltimore, Maryland.

Claim—1st, The combination of a set of crushing or attrition rollers with an upper and lower rubber, arranged substantially as described. 2d, Introducing an independent current of water into the amalgamator, so as to flow around the lower end of the feed-pipe, and meet and mingle with the inflowing current of material. 3d, In combination with the rollers constructing the lower rubber hollow, with openings to admit the quicksilver into the interior, for the purpose set forth. 4th, Constructing the lower rubber with a vertical passage through its centre, arranged as described. 5th, The combination of the concave plate, arranged with the rollers for the purpose of directing the inflowing current to the centre, and between the rollers. 6th, Constructing recesses on the interior of the casing over the journals, arranged substantially as described.

141. SEED PLANTERS; James F. Beckwith and Adin G. Gage, South Alabama, New York.

Claim—The arrangement of the tooth, discharge spout, coverers, hoppers, frame piece, lever, and bar, substantially in the manner set forth.

142. SELF-PRIMER FOR FIRE ARMS; Wm. H. Bell, Washington City, D. C.

Claim—1st, The combination of the shield, plunger, spring, and screw-head, with the magazine chamber. 2d, The arrangement and combination of the pin on the piston, and slot in the shield, with the slot in the side of the hammer, for the purpose specified. 3d, The removable guard plate, as arranged and operated for the purposes set forth.

143. SOFA FRAME; Peter Born, City of New York.

Claim—A complete frame of a sofa made of thin layers of wood, in the manner specified.

144. COMPOSITION FOR ORNAMENTING GLASS; Jules Joseph Henri Brianchon, Paris, France.

Claim—The yellow coloring composed of resin, nitrate of uranium, essence of lavender, and the flux of bismuth; also, the orange red coloring, composed of resin, nitrate of iron, essence of lavender, and the flux of bismuth; also, the imitation gold coloring, composed of the above described orange red coloring and the yellow coloring mixed together, with additional parts of the preparation of uranium and iron; also, the variegated prismatic coloring, composed of ammoniuret or cyanuret of gold, or gold dye, turpentine, essence of lavender, the bismuth flux, and uranium; also, the mother-of-pearl coloring, composed of the bismuth flux, the flux of lead, chloride of antimony, resin, lavender, or other essence, and colophony.

145. LUBRICATING COMPOUNDS; Reuben R. Brown, Buffalo, New York.

Claim—A lubricator made of the ingredients and in the proportions set forth.

146. Seeding Machines; W. G. Bulgin, West Jersey, Illinois.

Claim—The rotary coulter, leveler, with share attached, and harrow teeth, arranged relatively with respect to each other and to the seed box, provided with a suitable seed-distributing device, so as to operate substantially as set forth.

147. Wind Wheel; Abner L. Butterfield, West Dummerston, Vermont.

Claim—Attaching the sails to the frames of the arms, so as to permit of a self-lateral adjustment of the same, and using the catches and slides with cords attached, for respectively locking the sails and freeing them from the locks or catches.

148. Belt Clasps; George Churchill, Hartford, Connecticut.

Claim—The combination of the plates, pins, and screws, as described.

149. Mode of Operating Window Blinds; John Clark, Williamsburgh, New York.

Claim—Attaching toothed flanches or pinions to the tenons of the slats, and having the flanches or pinions gear into a sliding rack bar placed in the stile of the blind, and actuated by the pinion and supplemental rack teeth, or their equivalents.

150. Canteen Gun Stock; Samuel Colt, Hartford, Connecticut.

Claim—So constructing the stock of a gun that it shall constitute a canteen, as described.

151. Boot-blacking Apparatus; J. M. Connel, Newark, Ohio.

Claim—The concave-edged self-adjusting brush wheel, in combination with the spring foot-piece, constructed as described.

152. Ploughs; G. D. Cotton, Galesburgh, Illinois.

Claim—Combining and arranging together the beam, the standards, upright, lever, brace, bar, axle, and pole, said pole reaching forward and resting upon the neck yoke, in the manner specified.

153. Cultivators; Jesse Cunningham, Marshall, Missouri.

Claim—Attaching the furrow shares to a swinging frame formed of the shaft, bar, and arm, placed in a mounted frame, in combination with the buttons provided with step-like projections for regulating or adjusting the height or inclination of said share frame, and consequently the depth of the furrows.

154. Railroad Chairs; Wm. M. C. Cushman, Albany, New York.

Claim—The buttress at each end of the outside jaw flanch or rib, in combination with the top or bearing surface, as described.

155. Horse Rakes; L. S. Deming, Newington, Connecticut.

Claim—The combination of the fingers, shaft, or axle, cam, and lever, these several parts being constructed in the manner described.

156. Spoke Machine; L. J. Dickason and John Frazee, Georgetown, Ohio.

Claim—1st, The described mode of operating the cutter frame with its cutters, and also the emery wheel and its frame, so as to throw them all clear of the spoke after the operation of twining and smoothing, that is to say, we claim the employment of the two arms upon the shaft, operated by means of a hand lever. 2d, The adjustable spring rests, when arranged in the manner set forth. 3d, The spring arm, spring catch, pitman, and bent lever, in combination with the lever, clutch, and rod, arranged so as to throw the pulley wheel in and out of gear with the shaft, in the manner set forth.

157. Machine for Making Printers' Rules; Richard Doble and M. Angelo Starr, Richmond, Indiana.

Claim—The combination of the graduated plates, having arc-formed and radial graduations and guide bars, with their clamping screws and screw clamps arranged in relation to the saw, for the purpose set forth.

158. Railroad Chairs; Henry A. Landry, Camden, New Jersey, Assignor to R. G. Ransford, Troy, N. Y.

Claim—The improvement of a projecting piece of metal, either cast on the railroad chair or made of wrought iron or steel, and affixed and rising up alongside of the rails on railroads where two rails meet, and of sufficient height to receive all or a part of the weight of the machinery, while passing over that particular part of the rails, as described.

159. Car Couplings; Wm. Layland, Mixerville, Indiana.

Claim—The employment of the combined adjustable latch and catch, when constructed substantially as described.

160. Ventilating Registers; Joseph Leeds, Philadelphia, Pennsylvania.

Claim—In combination with a register, the hanging of a valve by its centre, so as to make said valve a regulator or cut-off to the ascending current of air, from N to M, and at the same time a regulator of the ingress or egress of air to or from an apartment, and thus causing a register to serve the purpose of a ventilator, as described.

161. Machine for Bending Umbrella Ribs; Ferdinand Lehr, Hoboken, New Jersey.

Claim—1st, A reciprocating pincer, taking the wire from a fixed and drawing the same through the machine, dropping said wire, and then returning below to its previous position, so as to be out of the way of the bending or coiling of the wire into eyes or loops. 2d, Attaching said pincers and traveling carriage by one side thereof, while the power for sliding said pincers lengthwise of the machine is applied to the other jaw, whereby the clamping and releasing of the wire is effected by the act of moving said pincers. 3d, Attaching one end of said pincers on a stud or shaft, in combination with the stops, spring, and slotted connecting link, whereby the sliding, clamping, depressing, and elevating motions are given to the pincers by the reciprocations of said rod. 4th, The shear receiving the compound motion set forth from the cams, in the manner specified. 5th, The clamping levers, in combination with the ledges and shafts that press against and hold the wire while the loops are being formed. 6th, The mandrels, in combination with the turning shafts and stubs, when the said mandrels are projected from the blocks, or their equivalents, for the wire to be bent around the same, to form the loops or eyes in the spokes or ribs, and withdrawn from said eyes when the same have been bent. 7th, The arrangement of the sliding bar and the connexions therefrom to the clamping levers and slides, whereby the clamps and mandrels are simultaneously actuated. 8th, The sliding stocks carrying the shafts and turning stubs, for allowing the withdrawal of said stubs out of the way of the traveling pincers, and in combination therewith the bar and connexions therefrom to said stocks for communicating endwise motion to said stocks. 9th, The sliding mandrel and turning shaft connected, in combination with the jaws, or their equivalents, for turning the eye or loop in the end of the spoke or rib. 10th, The arrangement of the cranks and slotted connecting rods for communicating motion successively to the slides, and from the same to the turning stubs or loop formers.

162. MILK COOLERS; Jacob Mansfield, Jefferson, Wisconsin.

Claim—The portable milk cooler, when constructed in the manner set forth.

163. HEMP BRAKES; Richard Mansley, Philadelphia, Pennsylvania.

Claim—Operating the slide with its transverse bars by the cam, arm, and spring, when arranged substantially as described, and when the said spring is so graduated that the slide shall instantly recede after reaching the limit of its outward movement.

164. MACHINERY FOR TARRING OAKUM; Richard Mansley, Philadelphia, Pennsylvania.

Claim—The perforated vessel, or its equivalent, placed within a stationary vessel, which contains the compound for tarring oakum, a jet of steam being admitted to the stationary vessel, while a reciprocating motion is imparted to the perforated vessel.

165. HORSE SHOE MACHINE; B. A. Mason, Newport, Rhode Island.

Claim—The combination of the four hammers, arranged in pairs, the two constituting each pair being mounted to strike simultaneously and in opposite directions, and the two pairs working at right angles with each other, or nearly so. Also, the employment of an elastic bush in the connexion of the hammers with the cranks, by which they are operated.

166. HOLDERS FOR LAMPS; Charles Monson, New Haven, Connecticut.

Claim—The mode or means of counterbalancing the system of levers or lazy tongs, or the same and one or more articles suspended from or supported by them, and this, whether the counterbalance weight be applied, so as to push or pull on the levers of the lazy tongs. Also, the method of steadying the tube or rod, or its equivalent, suspended or extending from the lower termination of the system of crossed levers or lazy tongs, viz: by the collar or slide, the levers, and the connexions, applied to the part, and the lazy tongs, and made to operate essentially, as specified.

167. CONSTRUCTING A COMBINED STREET-PAVEMENT RAILROAD TRACK; Richard Montgomery, City of New York.

Claim—A combined street-pavement and railroad track, constructed substantially as described.

168. REVOLVING FIRE ARMS; Henry S. North, Middletown, and Edward Savage, Cromwell, Connecticut.

Claim—1st, The employment of the movable cylindrical bushing-rings or thimbles, applied substantially as described, within cavities formed in the front portions of the chambers of a rotating chambered-breech, which has a longitudinal movement to operate and be operated upon, in combination with a valve-like seat, which is formed upon the rear of the barrel. 2d, The combination of the slide working in the bottom of the cylinder frame, and the double-jointed trigger-guard, part of which constitutes, also, a part of the lever, through whose agency the rotation of the cylinder and cocking of the hammer are effected.

169. WASHBOARD; John K. O'Neal, Kingston, New York.

Claim—The flexible rubber combined with the washboard, so that its upward movement shall be assisted by a spring, or its equivalent.

170. COLORING AND CURING TOBACCO-STEMS; Benjamin Payn, Albany, New York.

Claim—Coloring and curing tobacco-stems at one operation, by subjecting them to the action of steam.

171. CLOTHES SPRINKLER; Thomas Payne, Ridgefield, Connecticut.

Claim—A clothes sprinkler having an interior self-closing stopper, and made in the manner set forth.

172. FURNACES; Samuel Pierce, Troy, New York.

Claim—The series of detachable or removable heat-radiating plates constructed with points or stems, projecting from their surfaces, both of the surfaces being radiating surfaces, in the manner described. Also, in combination with a horizontal fire-box and fire-chamber, and the outer casing, a series of plain heat-radiating plates, or a series of corrugated heat-radiating plates.

173. CARPET-SWEEPER; Samuel F. Pratt, Roxbury, Massachusetts.

Claim—In combination with the case and the rotary brush of a carpet-sweeper, a serrated or toothed clearer applied so as to cleanse the brush, during and by its revolutions. Also, the arrangement of serrated or toothed clearers on opposite sides of the brush, in order that it may be cleansed while being rotated in either direction. Also, the arrangement of the serrated clearer in the case of the carpet-sweeper, in such manner that the said clearer shall form part of, or be maintained by, the dust receptacle. I do not claim the application of a single elastic-tired driving-wheel to the driving-wheel affixed on the brush-shaft; but claim the arrangement of two of the elastic-tired wheels on opposite sides of the driving-wheel of the brush-shaft, as described, and so applying the said shaft in the case and to the fork of the handle, as to enable the brush-wheel to be forced in close contact with its drivers, not only when the machine is moved in either direction, but by the force exerted through the handle, and to so move the machine, the same insuring the rotary motion of the brush, whenever the machine may be in the act of being moved on and over a carpet.

174. MODE OF ATTACHING THILLS TO VEHICLES, &c.; R. P. Brindle, Coventry, New York.

Claim—The flanch on the bolt or pin, so made and inserted that it cannot be removed when the joint is varied from the position in which the bolt is introduced.

175. COUPLING GUN STOCKS WITH PISTOLS; Samuel Colt, Hartford, Connecticut.

Claim—The neck piece with its projecting end passing under shoulders in the lock frame, in combination with the holder pins and clamping bar, arranged as described.

176. FILE HANDLES; Wm. W. Draper, Greenfield, Massachusetts.

Claim—The centralizing socket or socket piece and spring, in combination with the handle and the fastening jaws and their operative mechanism, applied within the said handle.

177. BATHING APPARATUS; Charles Escudier, Pattersonville, Louisiana.

Claim—The application in bathing apparatus of two boilers and steam pipe connected thereto, affording, when united, an apparatus for the application of whatever kind of bath that may be desired.

178. OX YOKES; James D. Foster, Montgomery, Alabama.

Claim—Constructing the bows of four parts, a a, b b′, the parts, a a, being permanently attached to the stock, and the parts, b b′, attached by hinge joints to the parts, a a, and provided with a fastening, substantially as set forth.

179. MACHINERY FOR MOVING RAILROAD CARS ON RAILWAYS; Ambrose Foster and Harvey Brown, City of New York.

Claim—1st, The rope supporter, constructed in the manner set forth. 2d, The sliding rods with the coiled

springs attached, or their equivalent. 3d, The grab or catch, constructed in the manner and for the purposes set forth.

180. Vegetable Cutter; J. Fraser, Rochester, New York.

Claim—The combination of the eccentric rod, arranged as described, with the pivoted or adjustable bed which bears the knife.

181. Cattle Pump; Hugh Gerred, Sparta, Illinois.

Claim—The arrangement and combination of the guides and bucket, the latter having a valve, clasp, and spring, the trough, platform, and wheels, as described.

182. Steam Valve; Henry Goulding, San Francisco, California.

Claim—1st, Supplying the working cylinder of the engine or machine at each successive stroke with its impelling gas or vapor from reservoirs previously charged therewith, and under the control of a valve or valves, the same serving as a substitute for a cut-off to work the gas expansively. 2d, Operating a valve in part or in whole by the gas or steam, at full pressure, from the supply pipe acting to propel it in the one direction, when the same is used in concert with an opposing force to the valve, produced by the expansion of the gas in its passage to or performance of its work. 3d, The combination of the valve and valve cylinder or case with its reservoirs, and the several inlets or outlets for action together, in the manner described, and whereby the one valve is made to govern the ingress and egress of the gas to or from the reservoirs, as well as to control the inlet and exhaust of the working cylinder.

183. Corn Planters; James Hughes and Nathan Stoneleiper, Cambridge, Maryland.

Claim—The detached arrangements of the gravitating trigger, connecting rods, perforated slide, hoppers, and scorer, operating as described, to deposit seed at each pressure and relaxation of the thumb of the driver.

184. Heating Apparatus; Rensselaer D. Granger, Philadelphia. Pennsylvania; ante dated Nov. 24, 1858.

Claim—Combining the air chamber with the separate perforated chamber, having an independent communication with the air, so that the said perforated chamber may serve the double purposes of consuming the gases arising from the ignited fuel, and of preventing the rapid destruction of the bottom of the chamber by the action of the fire.

185. Coal Stoves; R. D. Granger, Philadelphia, Pennsylvania; ante-dated Nov. 24, 1858.

Claim—Hanging within the stove and immediately above the fire, a perforated chamber, when so constructed and arranged that the air shall have free access to the interior of said chamber, and when the latter shall admit of being readily raised and lowered, or its position in regard to the fire otherwise altered.

186. Fish Trap; Robert Gray, Anson, Maine.

Claim—The strainer, the vibrating slats, and the V-shaped chambers, in the manner specified.

187. Fastening for Breastpins, &c.; Benjamin F. Grinnell, City of New York.

Claim—The permanent hook and spring, in combination with the hinged pin of a breastpin, or other article of jewelry, when the spring is so bent as to direct the pin, when the latter is depressed, into the hollow of the hook, and when the spring and hook are otherwise arranged in respect to each other.

188. House Ventilation; John H. Griscom, City of New York.

Claim—The employment of an auxiliary flue or tube, connecting the hot air flue with the ventilating flue, in the manner proposed.

189. Cotton Cultivators; John M. Hall, Warrentown, Georgia.

Claim—In combination with the series of adjustable revolving hoes, the scrapers, in advance of them, substantially as described.

190. Apparatus for Evaporating Saccharine Juices; Lyman P. Harris, Mansfield, Ohio.

Claim—1st, The stationary yet portable fire-place, with the stops and the springs. 2d, The portable, movable, and inclined furnace, and its combination with the stationary fire-place. 3d, The handles and their springs, and their combination with the springs; also, the rod, or its equivalent. 4th, The racks and their combination; also, the movable flue or plate and its rod, and their combination with the movable furnace and stationary fire-place. 5th, I do not claim the heater, nor evaporator, as my invention—but I claim, as an improvement, the application of one or more strainers and valves to the heater and evaporator.

191. Coffee Roasters; Theodore Heerman, Mitchelsville, Tennessee.

Claim—1st, The specified arrangement of the plates or shelves, for the purposes set forth. 2d, The combination of a window or windows in one or both ends of a coffee-roaster, with the inclined elevating plates or shelves.

192. Corn Planters; John L. Hoag, Geneva, Illinois.

Claim—The arrangement and combination of the arm, lever, K, and bar, said lever serving as an oblique brace to hold the bar. Also, the arrangement and combination of the lever, slide, lever (j), upright, bar, and swinging frames, as described.

193. Revolving Harrows; Mark W. House, Cleveland, Ohio.

Claim—The combination with the spindle of a revolving harrow, of the cap and box, for the purpose described.

194. Cattle Pumps; John H. Irwin, Carlenville, Illinois.

Claim—The platforms, weight, drum, and pulley, placed loosely on drum, and connecting with it by the pawl and ratchet, the whole being combined as set forth.

195. Composition for Lining Metal Pipes; Wm. Johnson and Hugh Forbes, Brooklyn, New York.

Claim—The composition of matter, substantially as set forth, for lining metallic, or other pipes or surfaces of a similar kind.

196. Harvesters; Wm. F. Ketchum, Buffalo, New York.

Claim—The combination of the openings in the guard-tooth below the cutters with the caps above the cutters, as described.

197. Rolling and Pressing Wool; Wm. W. Purdy, Liverpool, Ohio.

Claim—The combination of the sectional rollers with the strap and breast-piece, for the purpose of rolling and pressing fleeces of wool, as described.

198. Truss Springs; J. W. Riggs, City of New York.

Claim—Constructing springs for trusses, in the manner set forth.

199. Method of Packing Cartridges; E. K. Root, Hartford, Connecticut.

Claim—Putting up cartridges between two blocks, or their equivalents, as described. Also, forming in the package or holder a receptacle or receptacles for containing caps or other primings, as described.

200. Seeding Machines; John F. Seaman, Clyde, New York.

Claim—Operating the seed-distributing device by means of the part of the handle attached by a pivot to the other part of said handle, and connected at its lower end to the shaft by a cord or chain, the above parts being used in connexion with the spring attached directly to the other handle of the implement, and to the shaft, by a cord or chain, the whole being arranged as set forth.

201. Horse-shoe Machine; Solomon Shetter, Allegheny, Pennsylvania.

Claim—1st, The curved arms of clamps, moved and operated by the friction rollers, and the backward and forward movements of the table, when the clamps are used in connexion with the dies, as described. 2d, The use of the flexible strip, for the purpose of operating the clearer, as described. 3d, The arrangement on the upper surface of table, of dies, springs, the under jaw of the shears, and the clearer, when used and operated in connexion with the clamps, friction rollers, roll, shear, and swage, as described.

202. Sweeping Machine; Stephen Wm. Smith, Brooklyn, New York.

Claim—1st, The combination of the gears with the driving-wheel, constructed as described. 2d, The method of adjusting the brush by the plate, which admits of both vertical and lateral adjustment. 3d, Preventing the escape and rising of the dust by means of the flexible curtain.

203. Manufacture of White Lead; Benjamin F. Smith, City of New York.

Claim—The manner of filling the chamber with metallic lead, by means of the open work tables or racks in which the lead in detached pieces rests, arranged one above the other in successive and close series, and whereby a more thorough and equal circulation of the fumes or gases amongst the lead is produced. Also, constructing the converting chamber with an inclined bottom. Also, the method described of extracting from the converting chamber the carbonate of lead, and other incidental products, by means of a current or currents of water passing through said chamber from top and bottom. Also, subjecting the carbonate of lead, and other incidental products, previous to their extraction from the converting chamber, to the action of steam, substantially in the manner specified.

204. Instrument for Turning the Leaves of Music Books, &c.; C. B. Thayer, Boston, Assignor to self and Charles Robinson, Cambridgeport, Massachusetts.

Claim—The double holding cords, elastic springing cords, or their equivalents, back or catch band, provided with clamps, and notch, and the curved eccentric rod or way, operating in connexion with, and in relation to, each other, in the manner specified. Also, the escapement catch, operating in connexion with the curved rod and thimbles of the holding cords, as described.

205. Horse Power; Ferdinand M. Sofge, Columbus, Georgia.

Claim—The combination of the cogged wheel, having the supporting flanch and the wheel, with corresponding cogs and bearing, revolving upon the supporting ring.

206. Cooking Stoves; P. P. Stewart, Troy, New York.

Claim—In combination with a stove, such as described, making the front plate of the oven open with doors, and an apron to receive and hold a tin kitchen or roaster, that the heat radiated by the front plate of the fire chamber may be aided by the heat radiated by all the oven plates when combined with an end door, whereby the draft may be controlled without the aid and independent of the front doors. Also, the boiler having a removable cover and two inclined flues, which are separate at the lower end, united into one at top to connect with the chimney, in arrangement with the exit flue space, to which the boiler is fitted, and into which the gaseous products of combustion are discharged from the series of direct and return flues, substantially as specified.

207. Devices for Gathering Grain into Gavels; W. M. Waggoner, Middletown, Indiana.

Claim—The stationary fingers and the fly or gathering fingers attached to a suitable framing or stanchions, mounted on wheels, as set forth.

208. Devices for Reefing Sails; Louis B. Wakeman, Baltimore, Maryland.

Claim—The employment of the smooth-surfaced clamp, as described, when in combination with the forked screw-bolt, or its equivalent, carrying the blocks through which the rolling halyards pass, for the purposes set forth. Also, giving direction to windlass ropes by the bent arm, when in combination with the clamp and forked screw-bolt, when fitted with an ordinary block, operating in the manner set forth.

209. Harvesters; Wm. M. and Andrew Whitely Springfield, Ohio.

Claim—A finger so constructed that the slot or opening above the cutters shall increase in capacity from front to rear, in combination with the clearing projection described, passing directly into the rear corner of said opening, in the manner described. Also, forming the clearing projections of a bent extension of the cutter, as described.

210. Railroad Chairs; John Young, West Galway, New York.

Claim—The combination of bearing surfaces capable of forming any desired angle with each other, and the securing portion of the chair, substantially as set forth.

211. Grain-Fan and Corn Sheller; Hamilton E. Smith, Philadelphia, Pennsylvania, Assignor to self, D. B. Nelson, Cortland Co., and John L. Myers, Chemung Co, New York.

Claim—Arranging the spiked roller and slotted shield of a corn sheller on the frame of a grain-fan, in respect to, and in combination with, the sieve frame, blower, and inclined plane of the said grain-fan, in the manner described, so that the said blower, sieve frame, and inclined plane, may serve the purpose of separating the cobs from the shelled kernels of corn, and the latter from the chaff, and other refuse.

212. Manufacture of Steel; Frantz Anton Lohage, Unna, Prussia, Assignor to Edmund Leopold Bewzon, Boston, Massachusetts; patented in England, January 29, 1850.

Claim—Regulating the heat and stopping the decarbonization of the fused mass of metal in the finishing process in the puddling or reverberatory furnace, before it becomes converted into malleable or wrought iron, and whereby I obtain steel in the manner specified.

213. Paddle Wheel; Nelson Orcutt, Assignor to self and G. W. Gregory, Binghampton, New York.

Claim—The centrally suspended paddle or bucket without any stop, means, difference of area or of weight,

for holding it in a working position, but left entirely to the action of the forces exerted upon it during the revolution of the wheel, as set forth.

214. UMBRELLA FRAMES; Joseph Bloom, Assignor to R. E. Rogers, Philadelphia, Pennsylvania.

Claim—The bow or rib, constructed substantially as described. I am aware that the bow or rib, and the brace or sustaining rod, have been attached to collars upon the standard by a piece of metal having an enlarged end affixed to the end of the bow or rib, and a like piece of metal affixed to the end of the brace; the enlarged end fitting into a slit of a sheet metal collar, the flanch of which must be swaged down upon the enlarged end, in order to hold it in place; and I therefore do not claim this method—but I claim connecting the bow or rib and the brace or sustaining rod to the collars upon the stem or standards, by the means set forth. I am also aware that the end of the brace or sustaining rod has been connected to the bow or rib, by the end of the brace being riveted to a band, which may be sprung into a groove in the inner surface of the bow or rib, and I therefore do not claim this method of connecting the two parts here named—but I claim connecting the brace or sustaining rod to the bow or rib by the spring board embracing the bow, as set forth.

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215. TREATMENT OF FATTY ACIDS; J. C. Appenzeller, Cincinnati, Ohio.

Claim—After subjecting the mixture for a time to the direct action of steam, shutting off the steam from it, and raising its temperature by the application of heat to the exterior of the vessel.

216. VALVES FOR STEAM ENGINES; Robert Bailey, Troy, New York.

Claim—The arrangement and combination of the tubular valve, seat, induction pipe, eduction valve, levers, and cams, as described.

[The puppet valves of a steam engine are, in this invention, constructed with hollow tubular stems fitting with stuffing boxes directly to the induction and eduction pipes of the engine, and making communication directly through their interiors and around the exteriors of their seats between the pipes and the cylinder, thus very simply making them balanced valves.]

217. CAR SEATS AND COUCHES; W. M. Baker, Walpole, Indiana.

Claim—1st, The arrangement and combination of the boards, arms, curved bar, legs, fenders, slide, seat, and rods, as described. 2d, The arrangement and combination of the curtain, H, the seat backs, drums, weights, curtains, U, and rod, so that when the rod descends, the curtains, U, will fall, and the curtain, H, rise, and when the rod is released, all the curtains will be simultaneously rolled up.

218. BRICK MACHINE; Gerard Bancker, City of New York.

Claim—1st, The combination of the adjustable plunger with the side rods and rods of the rotating mould box, for operating the compressors, in the manner described. 2d, The use of the cleat, in combination with the rotating moulding box and semicircular stationary cap plate, as described. 3d, The use of an elevator plunger, operating in combination with the rectangular rotating mould box, adjustable compressors, and cap plate, as a device for moulding and compressing clay into bricks, and discharging the same therefrom.

219. APPARATUS FOR DISPLAYING STEREOSCOPIC PICTURES; Joseph Beckel, City of New York.

Claim—1st, In combination with an endless chain of pictures, the revolving prism, arranged and operating as described. 2d, The rest or stop. 3d, The concave. 4th, The pads or cushions, arranged and operating as specified.

220. WIND WHEELS; W. H. Benson, Wetumpka, Alabama.

Claim—Constructing a wind wheel of a series of strips or slats placed centrally on a shaft, spread, and overlapped, and secured together and to the shaft, as described.

221. SODA WATER APPARATUS; Edmund Bigelow, Springfield, Massachusetts.

Claim—The arrangement of a set of syrup cans, ice chamber, and draft pipe. Also, the combination of a measuring faucet with the described arrangement of devices for drawing the syrups and soda water.

222. MACHINERY FOR FORMING HAT BODIES; Seth Boyden, Newark, New Jersey.

Claim—Conveying the fur from the picker to the perforated cone, by means of jets of steam issuing from the tubes, arranged relatively with the picker and cone, as described.

223. LOUNGE; John G. Broemser, St. Louis, Missouri.

Claim—The described arrangement of the spring catch and the serrated arc. in combination with the pawl which gears into ratchet teeth at the lower edge of the hinges, and which is attached to a rocking crossbar, and connected to the catch. Also, the valve in the seat which is operated by an arbor, and by means of a cam and a hook, in combination with the sliding frame.

224. BOOT-JACK; Wm. W. Cansler, Baltimore, Maryland.

Claim—The metal folding boot-jack, described, with pointed prongs and pointed end.

225. MOLE PLOUGH; Jarvis Case, Bloomington, Illinois.

Claim—1st, So suspending the mole to the beam or coulter as that it cannot go vertically beyond a given depth, whilst it may move laterally. 2d, Extending the nose of the mole into the rear of the coulter, so that it cannot at any time run out of the line of cut of said coulter at its point.

226. FIELD FENCE; Seth Cheney, Riantone, New York.

Claim—The particular construction of panels, and its combination with the rails, in the manner set forth.

227. LAMPS; Samuel Cheney, Cleveland, Ohio.

Claim—The gas tube and openings, in combination with the wick tube and cap, when constructed as described.

228. AMALGAMATOR; Augustus M. Church, Augusta, Georgia.

Claim—The arrangement described of the vibrating riffles of the inclined trough, by which it is proposed to save the finest particles of the gold by amalgamation.

229. METHOD OF HANGING RECIPROCATING SAWS; John C. Cline, Philadelphia, Pennsylvania.

Claim—The employment of a spring either straight or spiral to suspend the fulcrum of pitman bars, or other reciprocating levers, in the manner set forth.

230. Portable Bedstead; Francis Cotton, Brooklyn, New York.

Claim—The arrangement of the stand rails, straps, and end supports, forming an improved portable bedstead.

231. Paper Rag Engines; Isaac N. Crehore, Boston, and Francis Stiles, Jr., Leicester, Massachusetts.

Claim—A bed-plate composed of sheet metal knives, corrugated or formed with a series of angles or curved lines through their entire length, in the manner described.

232. Railroad Chairs; D. W. Crocker, Deposit, New York.

Claim—The arrangement and combination of the inclined grooves, key, jaws, and rail, so that the weight of the cars will depress the base parts of the chair, and thereby cause the jaw parts to gripe the rail more firmly.

233. Field Fence; Daniel S. Curtiss, Madison, Wisconsin.

Claim—The mode of notching the ends of the rails, and keying together the ends of the panels, in the manner set forth.

234. Corn Huskers; Abbot R. Davis, East Cambridge, Massachusetts.

Claim—The combination of the rolls, spring board, slotted projection, and conical projection, when constructed in the manner described.

235. Sugar Cane Mills; Wm. T. Dennis, Richmond, Indiana.

Claim—The plating or covering of the iron roller of sugar cane mills with tin, or other anti-corrosive metal or substance.

236. Construction of Posts for Field Fences; John Drown, Huron, New York.

Claim—The arrangement of the braces, one fixed and the other hinged or pivoted thereto, in combination with the rails and chair, as specified.

237. Hydraulic Press; Richard Dudgeon, City of New York.

Claim—The described hydraulic press consisting of the injection piston, chambers, and ram, constructed as set forth.

238. Shoe Horns; Daniel E. Eaton, Boston, Massachusetts.

Claim—The improved shoe horn, as made with a heel guide and nipper jaw applied to two crossed levers and so as to operate together as specified.

239. Iron Bridges; Lewis Eikenberry, Easton, Pennsylvania.

Claim—1st, Having the uprights and diagonals of the side formings of the bridge so united together that they shall be capable of turning on their points of connexion, and thus, whenever expansion or contraction in the metal occurs, they may be able to compensate therefor without ceasing to brace the bridge at top and bottom. 2d, The combination of lattice side frames of bridges, formed of diagonal braces and angle iron uprights, which are united together, so as to turn on their points of connexion with tubular, semi-tubular, or angle iron arches, as set forth.

240. Coffee Pots; W. H. Elliot, Plattsburgh, New York.

Claim—1st, The combination of boiler, stillworm condenser, conducting or discharge tube, the external opening of the stillworm at g, when these devices are so arranged in relation to each other that an opening to the external air shall be provided for the non-condensible gases, while the condensible vapors are reduced to a liquid without coming in contact with the condenser water, and then turned by conductors into the boiler. 2d, The arrangement of the joint below the spout, so that no vapor can pass through the spout without first passing the joint. 3d, The employment of conductors in combination with the condenser, for the purpose of filling the water-joint or keeping it full.

241. Tanning; Lewis C. England, Owego, New York.

Claim—1st, Applying the liquor to the bark while said bark is being discharged from the mill, for the two-fold purpose of making it a conveyor of the same, and a preserver of the dust thereof. 2d, The method of applying the heated liquor to the bark, for the purposes and in the manner set forth.

242. Threshing Machines; John B. Ford, Addison Sullivan, and Albert Gregg, New Albany, Indiana.

Claim—The combination of the cutting cylinders, A A, provided with knives, the cylinder, C, and concave, B, provided with teeth, screens, and the fan, in the manner specified.

243. Sewing Machines; Wm. A. Fosket and Elliot Savage, Meriden, Connecticut.

Claim—The feeding device, so operating as to cause the cloth to progress by grasping the same with a positive force, in contradistinction to the employment of spring pressure between two surfaces moving in unison while feeding. Also, setting the shank of the revolving and reciprocating looping hook at an angle to the bed-plate, for the purpose of avoiding motion of the said hook in the direction of the axis of revolution. Also, operating the slide plate from above the sewing table by means of a feed-foot having two motions, one vibratory in the line of feed, the other reciprocatory and perpendicular to the table, or thereabouts.

244. Smut Mills; Carl Frank, Cleveland, Ohio.

Claim—Arranging between the trough containing the grain to be scoured and the scouring cylinder, a slotted hollow cylinder, revolving within another hollow cylinder.

245. Horse Powers; John Frezer, Newberry, Pennsylvania.

Claim—The combination of the flanch upon the end of the sweep shaft, with the groove in the collar, or its equivalent, for securing the shaft against the longitudinal motion, in connexion with the wheel and pinion attached to the sweep shaft, and the stationary wheel and pinion which keep the shaft in a directly radial position.

246. Combined Chair and Lounge; F. J. Gardner, Washington, North Carolina.

Claim—The seat, back, and supplemental back, connected together by joints, and provided respectively with the legs, arms, and rockers, as set forth.

247. Lanterns; Conrad Gersten, Brooklyn, New York.

Claim—The mode of controlling the currents of air which feed the flame, by taking the air from the top of the lantern and causing it to pass down in a narrow annular passage to the apertures leading to the burner, in combination with the deflector which encloses the burner chamber. Also, in combination with a lantern in which the flame is protected against disturbing causes outside, the arrangement for controlling the wick

from outside the lantern. Also, combining with the burner and the oil reservoir, and interposed between the two, an air chamber for preventing the oil from being overheated, as described.

248. Boring Machine; E. A. Goodes, Philadelphia, Pennsylvania.

Claim—1st, The adjustable worm attached to its shaft, and arranged as set forth. 2d, The gauge plate attached to the bow, in connexion with the index on the mandrel, for the purpose specified. 3d, The arrangement of the tube on the shaft, pinion, l', on said shaft, the pulley on the the tube, and also the pinion, i, and the rack on the mandrel, as set forth.

249. Hemp Brakes; John Hindman, Haynesville, Missouri.

Claim—The reciprocating beater, stationary bar, and reel, combined and arranged as set forth.

250. Screw Propeller; Augustus Jouan, San Francisco, California.

Claim—Combining with the rigid blades of a propeller, an elastic blade, as described.

251. Machine for Sawing Winding Forms; John C. Hitz, Cincinnati, Ohio.

Claim—1st, In combination with one or more shifting supports or rests, the rocking bench, suspended at or near its windwith by journals, and provided with suitable feeding and canting mechanism. 2d, In connexion with a carriage and crane, and with a rocking bench, having the described or equivalent feeding or canting mechanism, the vibratory and arched rest, armed with spikes. 3d, In combination with a rocking rest and spheroidal feed roller, the pointer, adjustable in height and having automatic retrograde motion, so as to indicate on the top of the slab the relative position of the bottom of the kerf. 4th, In combination with the rocking bench, the prying lever, constructed as set forth.

252. Method of Extracting Oil from Coal; E. N. Horner, New Brighton, Pennsylvania.

Claim—The use of a mixture of cream of tarter, common salt, and slaked lime, for the purpose of condensing the oleaginous vapor produced by the dry distillation of coal, shale, or other bituminous minerals, extracting the oil from the gas and depriving the gas of its inflammable quality, and throwing off the sulphurous vapor, in the manner specified.

253. Washing Machine; Benjamin Illingsworth, Freeport, Illinois.

Claim—A washing machine, having a tilting box, cylinder, spring rollers, and otherwise constructed as described.

254. Lamps; Richard Jenkins, Covington, Kentucky.

Claim—The combination of the inner and outer cones, when arranged in relation to the wick tube and each other, as specified, and supplied with air or oxygen, for the purpose of maintaining a perfect combustion of the heavier gases or matter arising, by capillary attraction, in the space or chamber existing between the cones, and thus producing, with coal oil, a brilliant flame, with very little, if any, blue appearance at its base above the outer cone.

255. Machines for Making Clay Pipes; John Jones, Baltimore, Maryland.

Claim—A two-sized permanent core or mandrel, in combination with the fixed die and adjustable jaws, constructed in the manner described.

256. Apparatus for Evaporating Sugar Juice; Augustus Jouan, San Francisco, California.

Claim—The floating cover applied to the evaporation of saccharine liquids, or for concentrating heat for other purposes, constructed as set forth.

257. Method of Blowing-off Steam Boilers; James H. Washington, Baltimore, Maryland.

Claim—Connecting the pipe, c, by an elastic or yielding joint to the stationary pipe, and furnishing its opposite end with a float that will keep the inlet into said pipe, c, at or a little below the surface of the water in the boiler, so as to blow off sediment, &c., at the surface, however much it may rise or fall, or vary.

258. Furnaces for Distilling Zinc; Samuel Wetherill, Bethlehem, Pennsylvania.

Claim—The employment of vertical retorts with movable caps at top and movable cups at bottom, in combination with the fire chamber of a furnace, and suitable chambers for the circulation of heat, when applied to the reduction of ores of zinc to the metallic state. Also, in combination with retorts for the reduction of the ores of zinc to the metallic state, the mode of mounting the vertical retorts, by having them sustained by their lower ends resting in suitable sockets, and unconfined at their upper ends, whereby they are free to yield to unequal expansion. Also, in combination with retorts for the reduction of the ores of zinc to the metallic state, the employment of two fires with separated ash-pits, whereby the fires can be separately cleansed and stocked, to admit of applying a continuous heat to the retorts. Also, in combination with vertical retorts for the reduction of the ores of zinc to the metallic state, the employment of perforated central tubes, for the discharge of the metallic vapors from the charge, and the condensation thereof to the metallic state. Also, the combination of the vertical retorts, the perforated central tubes, and the movable cups and appendages at the bottom, and the movable caps at the top, all concurring in the more ready changing of the retorts, the working of the charge, the escape and condensation of the metallic vapor to the metallic state, and the delivery thereof, and the discharge of the residuum from the retorts, and the re-charging of them.

259. Boat for Transporting Railroad Cars; Jesse Wheelock, Lancaster, New York.

Claim—1st, The arrangement of the ropes or chains, pulleys, and timbers, when applied to each end of the boat, for the purpose of holding the boat steady at the bow and stern while the cars are being transferred to or from the boat. 2d, The arrangement of the bumper dock relatively to the dock and slip, for the purpose of arresting the headway of the boat, and allowing it to be drawn sidewise into the slip, so that the track which runs lengthwise of the boat may be brought into line with the suspended track. 3d, The combination of the suspended track with or without the short portion, with the track on the boat, for the purpose of conveniently transferring the cars to or from the boat, at whatever height the boat may stand in the water.

260. Heating Apparatus; George W. Williamson, Scranton, Pennsylvania.

Claim—The application to fire chambers or smoke flues of a double series of plates, when the same are constructed in the manner set forth.

261. Rotary Pump; George Wingate, Philadelphia, Pennsylvania.

Claim—The revolving bucket wheel with any suitable number of pistons, operated by the cam, in combination with the exterior casing, its chambers, and partitions.

262. Washing Machine; George W. Wilson and Andrew Johnson, Walnut Grove, Illinois.

Claim—A washing machine, having upon the central cylinder a plate, arms, curved slats, and rod, for securing the clothes, and in the upper part of the cover a rubbing device consisting of a slat, with slats or corrugations at its sides and rollers.

263. Valve Gear of Oscillating Steam Engines; Herman Winter, City of New York.

Claim—1st, The method of causing a shaft by means of which the valves of an engine are moved to revolve through the agency of a cam, a lever, and a crank, and the oscillation of the cylinder to which the shaft is attached. 2d, The combination of a toe keyed to some rod which actuates a valve or valves, with an adjustable swinging toe and a revolving cam, as set forth.

264. Washing Machine; George L. Witsil, Wilmington, Delaware.

Claim—The combination of the corrugated or fluted conical cylinder, placed vertically with the corrugated or fluted sides of the conical tube, as described.

265. Process for Decomposing Fats; Robert A. Wright and Louis J. Fouche, Paris, France.

Claim—Producing a continuous automatic circulation of highly heated water in a very finely described state through the bodies under treatment, by means of an apparatus constructed as described.

266. Boot-jack; Wm. D. Young, Baltimore, Maryland.

Claim—The construction of a boot-jack, when used in combination with a chair, as described.

267. Clothes Frame; Daniel C. Colby, Keene, Assignor to self and Daniel W. Ransom, Croydon, N. H.

Claim—The arrangement of the levers, in combination with the pawl and the shaft, operating as set forth.

268. Drawing Frames for Fibrous Materials; Silas C. Durgin, Holyoke, Massachusetts, Assignor to self and Ammon R. Durgin, Nashua, New Hampshire.

Claim—The arrangement of the conical draft rollers between the gauge trumpet and the other reducing rollers, and supporting such trumpet by a mechanism, which will enable the said trumpet to operate both as a gauge to the sliver and to guide it to the rollers, and to be vibrated with regard to the conical rollers. Also, the combination of mechanism for supporting and vibrating the trumpet, the same consisting of the bent lever, the overbalance carrying lever, and the stationary stud. Also, the arrangement of the supporting arm, of the weight above the fulcrum of the lever, to operate with reference to the lateral drag of the sliver on the trumpet, as described.

269. Knitting Machines; Jonathan Filler and Joseph Bullock, Cohoes, Assignors to Wm. Smith, Albany, New York.

Claim—The apparatus attached to the stop carriage, viz: the combination of the slides, parol, gauge, and arm, operating together upon the breaking of the fabric to uncouple the driving powers by and in combination with the ring, pin, and spring, which release the detent.

270. Telegraphic Machines; David E. Hughes, Assignor to the American Telegraph Company, City of New York.

Claim—1st, Giving to the key, while still pressed by the operator, a second motion at the instant that the circuit is closed or broken, as the case may be, so that an indication of said closing or breaking will be given to the operator. 2d, The method for governing the position of the letters upon the type-wheel with respect to that of the platen or roller over which the paper travels, in order to insure an exact position of any particular letter at the moment of printing the same, viz: by so advancing or retarding the said type-wheel upon its shaft, whenever it has lost or gained in time in regard to the travel of the circuit breaker at the distant station, that the letter indicated will be certain to stand directly over the said platen at the movement the latter brings the platen into contact with said letters. 3d, Effecting the printing of each letter without arresting the motion of the type-wheel, by causing the platen to revolve in the same direction and with the same speed as the type-wheel, while said platen is bringing up and holding the paper in contact, whereby the paper is advanced along with the type or letter from which it is receiving an impression. 4th, The devices by which the type-wheel is started from its zero by an operator at a distant station, consisting of the shaft, set in motion by the electric current, and acting in combination with the clutch lever and the wheel, whereby the type-wheel will be advanced up to the time that it becomes engaged with its driving shaft.

271. Electro-bathing Apparatus; Wm. W. Karshner, Cincinnati, Ohio.

Claim—1st, The suspending non-conductor bands and the conducting foot-plate, insulated from the bath tub by the non-conducting substance. 2d, The combined use of the above described non-conducting bands, the conducting foot-piece, and the non-conducting substance, or their equivalents, for the purpose of administering an electric bath for therapeutic purposes.

272. Revivification of Bone Black; Henry Kattenhorn, City of New York.

Claim—The method of washing bone black or animal charcoal in the purifying of sugar, as described.

273. Knitting Machines; Chauncey G. Keeny, Manchester, Connecticut.

Claim—The employment of a card attachment to knitting machines, in the manner described.

274. Marine Steam Engines; Wm. Kennish, Jr., City of New York.

Claim—The application of an auxiliary pipe to the present discharge pipe of a marine steam engine, in the manner described.

275. Machine for Cutting and Setting Saw Teeth; Columbia G. Loynes, Lenox, Massachusetts.

Claim—The devices for punching and shearing metals, arranged in connexion with the saw-gummer and saw-set, in the manner set forth.

276. Machinery for Scutching Flax; Wm. C. McBride, Raritan, New Jersey; patented in England, May 20, 1856.

Claim—The mode of operation of the combined rotating blades or beaters, with the interposed stocks. Also, combining two scutching machines, by means of the two feeding wheels, with their bands for transferring the fibres which have been scutched at one end, that the other may be properly presented to the second scutcher. Also, in combination with the two sets of feeding bands and wheels, the sustaining and guiding table, by which the upper unscutched ends of the fibre are held up, guided, and properly presented to the second scutcher, as set forth.

277. Manufacture of Candles; Antonio Meucci, Assignor to D. B. Loraine, Clifton, New York.

Claim—The method of forming mould candles in saturated porous candle moulds, in contradistinction to the method in general use of forming them in candle moulds of impervious metals.

278. Heating Apparatus; U. D. Mihills, Hartford, Wisconsin.

Claim—A heat controlling cylinder, in which the regulating disks, shaped as described, are connected with a detachable frame.

279. Washing Machine; Wm. H. Milhouse, Sugartown, Pennsylvania.

Claim—1st, Securing strips of india rubber edgewise in slots in the concave and rubber, by means of the slots which are bolted in between the successive strips. 2d, The arrangement of the adjustable frame, levers, swinging rubber, pitman, and shaft, with the concave, constructed in the manner set forth.

280. Bed Bottom; B. F. S. Monroe, Utica, New York.

Claim—The two frames with the spring secured between them, the frames being connected by the cross bands covered or enclosed by any suitable fabric, and the upper frame supporting the seat or mattress, as set forth.

281. Pumps; Walter Peck, Rockford, Illinois.

Claim—The combined arrangement of the stationary standard, vibrating lever, and lifting spring, with tho plunger, as specified. Also, the combined arrangement of the hollow plunger having a cylinder and spout, and attached directly to the handle, with the stationary chamber and steadying springs, as specified.

282. Combined Punch and Awl; F. P. Pfleghar, Whitneyville, Connecticut.

Claim—The rotating hollow head provided with a series of cutter tubes of different sizes, in combination with the awl attached to, or forming a part of, the bent bar or rod, which, as well as the head, is attached to the jaw, and provided with a spring plate or stop.

283. Twisting Fibrous Substances; George W. Pittman, Bushwick, New York.

Claim—The application of the flyer, or its equivalent, in combination with the rollers and spool, or other equivalent means of holding the sliver, and taking up the twist produced by the flyer, whereby the same operation is made to spin the sliver into yarn, and twist the same with one or more other yarns, simultaneously.

284. Razor Strops; Michael Posz, Shelbyville, Indiana.

Claim—The self-lubricating razor strop, when constructed in the manner described.

285. Belt Trusses; H. H. Reynolds, Buffalo, New York.

Claim—The combination of the T-spring with the conical spring, pad, belt, and perineal strap.

286. Stoves; Philip Shreiner, Columbia, Pennsylvania.

Claim—The air-supplying tubes and air-heating cylinders, when combined with a stove, the heat of which is unobstructed by outside casings.

287. Photographic Plate Vices; M. M. Rison, Paris, Tennessee.

Claim—A photographic vice having its eccentric lever provided with a groove, a clamping jaw provided with a catch, to engage a jaw provided with a spring pawl, which engages a rack, and otherwise constructed as described.

288. Wagon Brake; Daniel Robinson, Lenox, Pennsylvania.

Claim—The combination and arrangement of the sliding frame, curved bars, attached to the rock shafts, and passing through the traverse bars of the frame, and the shoes, attached to the ends of the rock shafts, the several parts being fitted in the truck or bed, as set forth.

289. Machine for Splitting Wood; P. P. Ruger, City of New York.

Claim—The spring or yielding guide for relieving the cross-bars, in the manner specified. Also, the guide plate with the uprights, arranged in combination with the wood splitters, as specified.

290. Ball Furniture Casters; B. A. Russell, Deep River, Connecticut.

Claim—A furniture caster, when composed of cylinder or casing either with or without the radial set-screws or ribs, in combination with the plate and ball, constructed in the manner set forth.

291. Breech-loading Fire Arms; Christian Sharps, Philadelphia, Pennsylvania.

Claim—1st, Forming on the outer end of the sliding bush as the sole bearing point against the breech, an annular inclined projection with a sharp annular edge coinciding with the smallest portion of the bore of the said bush. 2d, The annular termination of the sliding bush fitting into an annular recess formed in the barrel, and over-lapped by the sharp-edged annular projection, as set forth. 3d, The convex base as fitted into a concave socket in the breech, so as to form a self-adjusting base for the end of the barrel.

292. Breech-loading Repeating Fire Arms; Christian Sharps, Philadelphia, Pennsylvania.

Claim—1st, Exploding in succession a number of cartridges of the class described, by means of a projection caused to revolve by the movements of the hammer, when the said cartridges are so arranged, in respect to the said projection, that the latter shall strike the edge only of each cartridge in succession. 2d, The catches, so arranged on the stock in respect to the bores of the barrel block, that on moving the latter from the breech, they may be the means of withdrawing the whole of the cartridge simultaneously from their respective bores, as set forth.

293. Boot Heels; Stillman Thorp, Portland, and Wesley Thorp, Turner, Maine.

Claim—The combination of the metallic plate spring or shank stiffener, and the rotary heel-piece, connected together and applied to the heel and shank of a boot or shoe, as specified.

294. Washing Machine; Wm. B. Twiford, Chincoteague, Virginia.

Claim—The opposing incline planes on the underside of the ends of the sliding roller frame, in combination with fixed concave projections or ledges on the sides of the tub or box, and with grooves of greater width than the diameter of the journals of the roller, in the sides of the box.

295. Lamps; Hezekiah Knowles, New London, Connecticut, Assignor to Fellows, Hoffman & Co., City of New York.

Claim—The lower or diaphragm reflector surrounding the wick tube at or near its upper edge, in combination with the upper deflector and the chimney, having suitable openings for the supply of a draft of air to the inside, and to feed the flame outside of the upper deflector.

296. Harvesters; Geo. W. Richardson and Robert Glover, Grayville, Assignors to selves, J. B. Williams, and Wm. A. Horrall, White Co., Illinois.

Claim—1st, The jointed spring arm, in combination with the spring catch, operating so as to catch and hold the arm when it has gathered the grain, and retain it in this position until the bundle is ready to be deposited free from the platform. 2d, The raker, in combination with the rod, crank, rest, and retracting weight, arranged to produce the reciprocating movements for gathering and delivering the gavel, in the manner described. 3d, In combination with the arm, the connecting rod, and bent lever, operated through the medium of rod, pin, and rest, by the driving-wheel.

EXTENSIONS.

1. COAL STOVES; Henry Stanley, Poultney, Vermont; patented January 4, 1845; extended January 4, 1859.

Claim—The manner in which I have combined and arranged the two stories thereof, consisting of two cylinders, with the eight triangular radiating flues, arranged around and in contact with them, said flues communicating with the flue space in the pintle, with the intermediate chamber, and with the corner space; the two latter being divided by partitions into anterior and posterior portions, and there being also openings through the upper end of the upper cylinder into the cornice space: it being distinctly understood that I do not make any claim to either of the individual parts, taken separately and alone, but that I limit my claim to the combination and arrangement thereof as a whole; not intending, however, by this claim, to confine myself, in constructing my stove, to the particular form of the respective parts, but to vary these as I may deem expedient, whilst I attain the same end.

2. SAW COTTON GIN; Eleazer Carver, Bridgewater, Massachusetts; patented January 4, 1845; extended January 4, 1859.

Claim—The combination of a cylinder brush, having fans on the ends thereof, with a cotton gin.

ADDITIONAL IMPROVEMENTS.

1. CROSS-CUT SAWING MACHINE; Albert Heth and Gaylon Hall, Adams Centre, New York; patented August 24, 1858; additional dated January 11, 1859.

Claim—Attaching the bar or beam to the vertical bar by a pivot, and securing the bar or beam and beam, in a proper relative position with each other by means of the rod, loop, and nut, or their equivalents, so that the bar or beam may be more or less inclined according to the thickness of the log, and the bar always retained in a vertical position. Further, in combination with the oscillating platform, lever, and saw-bar, the bar provided with an adjustable weight, and arranged as set forth.

2. HOMINY MORTARS; John Reezer, Chillicothe, Ohio; patented March 2, 1858; additional dated January 18, 1859.

Claim—The application and combination of the slide with its spring, and roughening of the lower end of the pestle.

RE-ISSUES.

1. REGULATING THE FLOW OF OIL TO THE WICK IN CARCEL LAMPS; Abraham Coates, City of New York; patented March 25, 1856; re-issued January 4, 1859.

Claim—Regulating the supply of oil to the burner by means of the self-employing drip cup, operating upon the supply valve. Also, placing the fountain or reservoir for the oil above the lens, with its draft opening and its supply pipe, within the barrel or chamber of the lens.

2. MACHINE FOR MAKING HAMES; Henry Burt and James Y. Hedden, Newark, New Jersey; patented Feb. 17, 1857; re-issued January 4, 1859.

Claim—The forging of metal into useful forms by the employment of two or more pairs of rolls having their surfaces cut away, and combined, and rotating, and pressing the metal progressively into shape, being conducted from one pair of rolls to another through the agency of the guide.

3. MACHINERY FOR DRESSING SCREW HEADS; H. A. Harvey, City of New York, Assignee (through mesne-assignment) of Thomas W. Harvey, late of said New York, patented August 18, 1846; re-issued January 4, 1859.

Claim—1st, The employment of a pair of spring pincers which receive the blanks one at a time, and present them to the jaws point foremost. 2d, In combination with the mandrel and jaws, or equivalent means for receiving and holding the screw blanks, the employment of a punch or driver for inserting the blanks to the required distance. 3d, The combination of the movable rest with the movable cutter head, and for the purpose of giving support to the blank and get out of the way so soon as the cutting operation is completed, and is claimed, whether the cutting operation be perforated on the head, or any other part of the blank. 4th, The particular manner of constructing the adjustable turning head, the slide or seat piece, the tool-holder sliding on the piece, between the check pieces, with the respective adjustments thereof, combined, arranged, and operating so as to effect the setting of the tool; the manner of operating the griping dies, and of separating the blanks in the hopper and conveying them to the feeding fingers, being similar to those described and used in the machine for cutting the threads.

4. SEWING MACHINES; Anthony W. Goodell, Brooklyn, and Nelson R. Scovell, Albany, New York, Assignees (through mesne-assignment) of Wm. Lyon, Newark, New Jersey; patented December, 1854; re-issued January 4, 1859.

Claim—1st, The combination of a feeding foot pressed on to the cloth and moved to feed the cloth, and then released from said cloth and returned to its former position, with a clamping foot that is raised when the feed of the cloth takes place. 2d, The vibrating bar, feeding foot, arm, and vibrating studs, arranged and acting to communicate motion to the feeding foot. 3d, A looping instrument constructed with a cavity or notch, and an eye carrying the second thread, and receiving a sideway movement after the said looper has passed through the loop of needle threads, for the purpose of carrying the second thread across and beyond the descending path of the needle, when said looper remains in a position for the needle to enter said cavity or notch, as it descends between the looper and second thread, and then said looper receives a sideways movement to its original position to clear the needle in drawing back. 4th, The reciprocating looper formed with the cavity, and with an incline, in combination with a stationary screw, or its equivalent, to communicate the required movement to the looper. 5th, The arrangement of the segmental spring, looper, and arm on the rocking shaft, for the purpose of adjusting and securing, by the screws, the looping point in the desired position with great ease and accuracy.

5. SAFETY INDICATOR FOR STEAM BOILERS; Lucius J. Knowles, Warren, Massachusetts; patented February 10, 1857; re-issued January 11, 1859.

Claim—1st, A feed apparatus, controlled by expansion and contraction, in combination with an expansion tell-tale, placed below the desired water level and above the level to which it would not be safe for the water in the boiler to descend. 2d, The described arrangement of the vessels, and as applied and connected with the feed pumps and steam whistle, for the purpose of regulating the pump and sounding an alarm. 3d, Connecting the pipe with the boiler, by means of the feed pipe, as set forth.

6. LAMPS; Edward F. Jones, Boston, Massachusetts; patented May 4, 1858; re-issued January 11, 1859.

Claim—Securing the chimney to the removable deflector, and both of them to the lamp cap, by means of a spring, operating in the manner set forth. Also, a detached deflector, in combination with a chimney, when the chimney is secured to the cap independently of the deflector.

7. VENTILATING WINDOW FOR RAILROAD CARS; George Neilson, Boston, Massachusetts; patented May 30, 1854; re-issued January 18, 1859.

Claim—The convergent ventilating window as made, with deflecting and light penetrating sides or surfaces, and an air opening, and a closing window or cover, essentially as explained, and to be applied to the opening of a side of a railway car, substantially as specified. Also, the arrangement of a deflector guard entirely around the window opening and in respect to the deflecting sides, as specified, not intending to claim a deflector or guard as applied to a car window opening, but to claim its arrangements on four deflecting sides or planes, and entirely around the opening between them.

8. RECLINING CHAIRS; Augustus Eliars, Boston, Massachusetts; patented May 11, 1858; re-issued January 25, 1859.

Claim—1st, The general arrangement of devices described for actuating and sustaining both the back and foot-rest, the same consisting of the arms attached to the back in a projection thereof, and having a shaft which travels in grooves, formed in the supporting frame work of the chair and the arms, the whole being combined with the foot-rest and frame. 2d, The combination of the device described, whereby the back can be placed and held in any desired position, and at the same time the proper length of arms retained, the same consisting of the hinged rails, sliding arms, locked upon said rails in any desirable manner, and mortises to receive the said rails, as set forth. 3d, The foot-rest, when combined with a spring or weight, or its equivalent, to operate as set forth, so that the said foot-rest may be raised or lowered at will, to adapt itself to the length of the limb of the occupant. 4th, In combination with a reclining chair, the pecular joint between the back and arms, consisting of the arm attached to the back, and turning upon a pivot in the groove or mortised sliding arm, whereby a very long arm may be obtained.

9. HULLS OF STEAM VESSELS; Ross and Thomas Winans, Baltimore, Maryland; patented October 26, 1858; re-issued January 25, 1859.

Claim—Constructing the hull in the form of a spindle, substantially as described.

DESIGNS.

1. DINING-ROOM STOVES; Conrad Harris and Paul W. Zoiner, Assignors to Harris, Zoiner & Co., Cincinnati, Ohio; dated January 4, 1859.
2. COOKS' STOVES; Conrad Harris and Paul W. Zoiner, Assignors to Harris, Zoiner & Co., Cincinnati, Ohio; dated January 4, 1859.
3. PARLOR STOVES; S. W. Gibbs, Albany, Assignor to Evan Backus, Stuveysant, New York; dated January 11, 1859.
4. INK BOTTLES; Thaddeus Davis, City of New York; dated January 11, 1859.
5. COOKING STOVE; J. K. Hyde, Troy, New York; dated January 18, 1859.

FEBRUARY 1.

1. APPARATUS FOR RAISING AND FORCING FLUIDS; Manoah Alden, Philadelphia, Pennsylvania.

Claim—The wheel with any convenient number of buckets formed by the opposite curved vanes, said vanes being placed obliquely to the plane of rotation, and being of a tapering form, so that the buckets may be broader near the centre of the wheel than at the edge of the same, in combination with a wheel race or chamber adapted to the form of the buckets, and with the spiral channel.

2. BURNERS FOR VAPOR LAMPS; Charles F. Allen, Indianapolis, Indiana.

Claim—The combination and arrangement of the tube and lighter, constructed as set forth.

3. COTTON PRESS; Zachariah Atkinson, Richmond, Georgia.

Claim—The cam rollers, in combination with the levers, as set forth.

4. GAS COUPLINGS; J. B. Atwater, Berlin, Wisconsin.

Claim—The arrangement of the tumbler, rod, connecting piece, lever, which is provided with a foot-piece, pin, rollers, and door or platform.

5. PUMPS; Charles F. Bellows, Seneca Falls, New York.

Claim—The arrangement and construction of a pump, as set forth, by means of right-handed and left-handed screws, the threads of one operating within those of the other.

6. OVENS; D. P. Burdon, Brooklyn, New York.

Claim—1st, The arrangement of a series of hinged cars around a disk plate, so that they will deliver bread pans with their contained bread at the proper place of discharge, and also receive the said pans in their revolution; and in combination therewith the circular track, so arranged as to support the ends of said cars upon friction rollers, while at the same time allowing each car to deposit its pan at the proper place, and restore said cars to their proper position to receive the return pans with their bread. 2d. Operating the sliding doors by means of the radial arms, or their equivalents, projecting from the driving shaft, so that the doors will be alternately opened and closed at the proper time for delivering the bread, and receiving the bread to be baked. 3d, Operating the traversing follower by means of radial arms, or their equivalents, for feeding the pans into the oven, when the same is so arranged that the pans will be fed into the cars while the door is open; and in combination therewith, the compensating pulley wheel and weight, for equalizing the motion and returning the traversing follower.

7. FLUXES FOR PUDDLING IRON; John Burnish, James Talbot, and Thomas W. Yardley, Pottsville, Penna.

Claim—The silicious sand, loam, alum, clay, lime, oxide of iron, and talcose rocks, when used collectively in, or nearly in, the proportions described, as a flux in the process of puddling iron.

8. WASHING MACHINE; Zjiba Casterline, Liberty, Indiana.

Claim—The employment of balls attached to the rubber of a washing machine, when said rubber has a reciprocating movement in the tub, constructed in the manner set forth.

9. MACHINE FOR POLISHING METALS; Reuben Cave, Louisville, Kentucky.

Claim—The running of two polishing grit stones edge to edge, in opposite directions, one immediately above the other, and both running at the same time, the upper stone running one-third faster than the under one.

10. RAILROAD CAR SEATS; Willis L. Childs, Piermont, New York.

Claim—Attaching to each end of the planes or boards, a curved or segment bar, lapping by each other, so that they will form an arc, having for its centre the point at which the planes or boards are hinged or jointed. Also, suspending a car seat upon the point, in combination with the hinging of the planes or boards, so as to enable it to be reversed without concussion, and also to be used as a reclining seat or sleeping couch.

11. WATER WHEEL; Wm. Coutie, Troy, New York.

Claim—The stationary plates, arranged so as to prevent a rotary motion in the water when acting on a screw wheel. Also, placing the gate below the surface of the back water, in connexion with the draft tube, for the purpose specified.

12. STOVES; Porter Dodge, Francistown, New Hampshire.

Claim—An improved air-tight stove, the several parts being constructed and arranged in relation to each other, substantially as described.

13. METHOD OF VARIEGATING WOOD; Joseph Cowee, Jr., Keene, New Hampshire.

Claim—The emyloyment of rollers, in the manner described, for the purposes of variegating wood.

14. SPLICE OF BAR RAILS; Wm. M. C. Cushman, Albany, New York.

Claim—In combination with the flat bar rail, the splice plate or piece, constructed in the manner described.

15. HARVESTERS; Charles G. Dickinson, Poughkeepsie, New York.

Claim—The combination of the curved arm, curved feet, and braces or compressors, with endless belts or chains, when arranged with relation to each other and to the platform, in the manner described.

16. ENVELOPE MACHINE; James B. Duff and Thomas W. Keating, City of New York.

Claim—1st. The combination of the pasters, the grooved pressure fingers, and the spring plates. 2d, In combination with a feeding table, having its surface composed of india rubber, or other elastic substance, the use of a plunger operating through a die above the said table, and provided with sharp projecting edges for the purpose, after it has forced the blank through the die, and thus turned back the flaps, of making a sharp crease where the fold is to be made, by pressure between said edges and the elastic surface. 3d. Placing the faces of the lappers in front of their centres of motion, and their axes above the level of the table, so that the plunger, when it descends, shall pass close against the faces of the lappers, and the heels of the lappers, when the latter close, will move outward away from the paper. 4th, Having an open space between the heel of the lappers to receive and hold the edges of the paper, when it is pressed therein by the descent of the plunger.

17. APPARATUS TO MANUFACTURE STARCH; Wright Duryea, Glen Cove, New York.

Claim—1st, The described system of arranging and combining the grinding, washing, and bolting apparatus, to wit: the arrangement of all the stoves side by side, with their respective washers conveniently placed below them, with the arrangement of the bolting cylinders below their respective stones in horizontal series, with one or more interposed endless chain elevators, combining them with the stones next in order of succession in the series, whereby the whole apparatus is brought within two stories of a building, and convenience is afforded for its supervision, and the other advantages set forth are obtained. 2d, The combined arrangement of the lower bolting cylinders and inclined plane or table, with the troughs or gutters, whereby I am enabled to convey away the starch water and the tailings from the said cylinders, by a single conductor for each purpose.

[This invention relates to the process of obtaining the starch water from which the starch is subsequently extracted, by grinding the grain between stones, then washing with water, and passing the ground grain and water through bolting cylinders, re-grinding the tailings from the cylinders, re-washing and re-bolting, repeating the re-grinding of the tailings, and the re-washing and re-bolting of the products, till nothing of the grain remains but the bran. Also, in the employment, in combination with a series of bolting cylinders arranged side by side, of a flat surface of sufficient extent to receive the starch water from the whole series, by which means a freer circulation of air is obtained through and between the cylinders than when separate concave troughs are employed under each one, thereby preventing the so rapid clogging of the bolting cloths, and obviating the necessity of the so frequent removal and washing out of the said cloths.]

18. MACHINE FOR TURNING OR EDGING BRICKS; Charles O. Farrington, Brewer, Maine.

Claim—The slats attached by joint hinges to the bars, A A, and connected by joint to the bar, F, which has the spring attached to it.

19. ESCAPEMENT FOR TIME-KEEPERS; Charles Fasoldt, Rome, New York.

Claim—The employment of a straight lever and collateral hook, in the position and form described.

20. MACHINE FOR MAKING WOODEN TROUGHS; Samuel T. Field, Worcester, Massachusetts.

Claim—Arranging the bearings of the saw and the mechanism by which it is driven, whereby the upper surface and also the interior of the saw is left unobstructed. Also, in combination with a cylindrical saw, a secondary cutter, arranged so as to groove the core of the stick while it is being sawed out by the cylindrical saw.

21. CRACKER MACHINE; Joseph Fox, Lansingburg, New York.

Claim—1st, The depressions in the spaces between the grooves in one or both of the rollers that form the strips of dough from the sheet. 2d, Forming short sections of skin-covered strips of dough into disks or crackers, by pressure applied to ends of the sections, by the devices described. 3d, The rollers, by which the crackers are rolled on the apron, and by which the skin on the upper surface of the pressed crackers is improved. 4th, The combination of the straight edges for evening the rows of crackers before rolling, and also for docking with the dockers. 5th, The employment of the clamp bars, in combination with the knife, to cut off and hold the sections of the strips of dough, as the strips are fed through the bar. 6th, The plane, follower, and second endless apron, as combined and arranged among themselves, and with the other endless apron, for the purpose of taking rows of crackers from a moving endless apron, and placing them upon the bake-pans.

22. SLIDE VALVES FOR STEAM ENGINES; James Freeland and R. H. Lecky, Allegheny, Pennsylvania.

Claim—1st, The arrangement of the armed flanch on the steam pipe, the columns, the studs, with nuts,

and the cap, the whole being arranged and secured to the valve seat, as described. 2d, The arrangement of chamber with opening, as described. 3d. The combination and arrangement of the armed flanch on the steam pipe, columns, studs, with nuts, stuffing-box, cap, and slide valve, with the valve seat, arranged as described.

23. HANDLES FOR TABLE CUTLERY; J. W. Gardner, Shelburne Falls, Massachusetts.

Claim—A table knife having its handle composed of two or more parts, the ends of which are encompassed by ferules, and otherwise constructed as described.

24. SPERMATIC RINGS; Dwight Gibbons, Rochester, New York.

Claim—The employment in a ring encircling the penis of a sharp pin or point attached to a spring which is held by a roller, or other equivalent rest, so as to prevent the protrusion of the said pin within the interior surface of the ring till distension of the penis occurs, and by its action on the spring causes its liberation from the roller or rest, and thereby permits the said spring to force the pin or point into the penis, with a sudden action, instead of with the gradual action peculiar to the points of other rings for the same purpose. 2d, The combination of the two semicircular or nearly semicircular springs, with the two rigid sockets, by means of a slot and set-screw in one of the sockets, which permits the ring of the instrument to be adjusted to organs of various sizes.

25. RAILWAY CHAIRS; J. W. Gould, Elmira, New York.

Claim—The self-securing "lock wedge," arranged in combination with the rails, chair seat, and key, in the manner specified.

26. RETORTS FOR DISTILLING COAL OIL; N. B. Hatch, Lawrenceville, Pennsylvania.

Claim—The application and use in retorts used in the distillation of coal, or other substances, from which oil or gas is producible, of a sweep bar or arm with plates attached and operated so as to push or spread the material placed within over the floor or bottom, and at intervals discharge the same continuously in openings at or near the edge of the retort.

27. SCRUBBING PAIL; A. P. Hawse and L. J. Adams, Morrisville, Vermont.

Claim—The combination of pail, rollers, and pieces, as set forth.

28. SHIRT COLLARS; G. W. Beard, Boston, Massachusetts.

Claim—As an improvement in the "turn down collar," the construction of the same with four cravat slots or passages, arranged therein or with respect to the ends of the inner fold of the collar, and for the purpose of receiving a cravat or tie ribbon. Also, the described mode of applying or arranging a cravat or neck tie in the collar, constructed with the four slots or passages arranged within it or with respect to the ends of its inner fold, essentially as explained.

29. WASHING MACHINE; John Hebden, Medford, Massachusetts.

Claim—The machine constructed with a removable dasher, or its equivalent, and a removable platform, combined and arranged with the suds reservoir and mangle rollers, as set forth, the whole not only enabling the operations of washing the clothes, expressing the water from them, and mangling them to be carried on consecutively, but causing clothes to be drawn out of the suds reservoir, and the express water to be received into it.

30. MILL FOR GRINDING CANE, &c.; Isaac A. Hedges, Cincinnati, Ohio.

Claim—1st, Surrounding the openings in the top and bottom plates with annular ledges, when employed in connexion with rollers having recesses corresponding with them in their top and bottom ends. 2d, The regulator and adjuster. 3d, The oil tubes, when used in connexion with a recess containing waste oil, to conduct the same through the rollers to the bearings below. 4th, The corrugated shells, in combination with the rollers, for the purpose of readily converting the mill into a corrugated mill.

31. CLOTHES FRAME; Dexter Henshaw, Fitchburg, Massachusetts.

Claim—The combination of the four arms and the block with the cords, screws, and braces, as described.

32. MACHINE FOR GRINDING AND POLISHING SAWS; J. A. Hendricks, Providence, Pennsylvania.

Claim—The grindstone or emery wheel, in combination with the feed rollers placed in the adjustable frame, as set forth.

33. ROTARY HARROWS; W. T. Hildrup, Harrisburgh, Pennsylvania.

Claim—Giving the sleeves an invariable connexion at one extremity, and a variable connexion attached to the draft bar at the other.

34. MACHINE FOR MAKING MEAL AND FLOUR; G. W. Holman, Beloit, Wisconsin.

Claim—Placing a series of knives supported by gudgeons in a circle, or part of a circle, so that the thickness of the shaving cut by the edge of one knife shall be gauged by the back of the knife next to it. Also, placing a series of knives, supported by gudgeons, so that the rankness of set of all of them may be uniformly graduated by one operation, and so that their faces may be thrown back into one uniform surface for grinding or sharpening. Also, the band at the end of the knives, constructed as described. Also, the arrangement of the reversed screw threads on the arbor, and the reversed screw threads on the core, for the purpose of moving grain in opposite directions at the aame time, as combined with the other parts of my machine.

35. MILL FOR GRINDING GRAIN; Wm. H. Hope, Washington City, D. C.

Claim—1st, The combination of a cylindrical corn and cob cutter and crusher for grinding food for cattle, with two sets of grinding surfaces, arranged as set forth. 2d, The arrangement by which the cylindrical rollers or cutters and crushers and grinding surfaces may be operated together or separately, as described. 3d, The mode of regulating the cylinders and stone for the purpose of grinding coarse or fine, by the use of the screw lever attached to the journal boxes, which move on ears or lugs firmly attached to a frame, in the manner described.

36. APPARATUS FOR REGULATING THE DRAFT OF ENGINES; W. S. Hudson, Paterson, New Jersey.

Claim—1st, The interposition of a perforated diaphragm between the steam and exhaust pipes, and extending down to or near the level of the lower tubes. 2d, Making the apertures above the base of the diaphragm of such area that when the locomotive is standing still, the gaseous products of combustion may flow through without serious obstruction, but that when the combustion is increased by the blast, a large portion is compelled to pass underneath.

37. OVENS; George C. Jennison, Ware, Massachusetts.

Claim—The application of the baking chamber of the endless carrier to the furnace, in such manner that the air within the said baking chamber may come into direct contact with the furnace charge or heated volatile products arising therefrom, and be heated thereby without the heat having first to pass through any divid-

ing wall or partition, or its equivalent. Also, the arrangement of the baking chamber with respect to the furnace and its discharge flues, whereby the advantage of the ascending power of the heat is availed of, while the smoke is carried off by the flues. Also, the arrangement of the charging and discharging orifices of the baking chamber, with reference to it and the lower smoke eduction passage leading into the discharge flue of the oven. Also, the arrangement and application of the pendulous platforms and the endless carrier, together and within the vertical baking shaft. Also, the combination and arrangement of one or more openings and their dampers, with the baking chamber and its furnace and flues.

38. Weighing Scales; O. W. Jipson, Rochester, New York.

Claim—1st, The sliding block, when provided with the rollers and slide or supplemental weight, arranged with or without the rack and pinion. 2d, The adjustable block, provided with the slide or weight and graduated bar, in combination with the nut or supplementary weight. 3d. The attachment of the lever to the platform frame, whereby the same may be adjusted farther in or out from the frame, as circumstances may require. 4th, The arrangement of the bars with their sockets and with the frame, to admit of the adjustment of the bars to receive platforms of greater or less size, as required. 5th, The employment or use of the sleeve attached or applied to the beam.

39. Floating and Revolving Derrick; E. Jones, Brooklyn, New York.

Claim—The arrangement of the turn-table or frame which carries the derrick, when placed on the bottom of the scow or below the deck. Also, supporting the upper turn-table or frame of the derrick, by means of a circle and wheels.

40. Horse-shoe Machine; Wm. W. Lewis, Cincinnati, Ohio.

Claim—1st, The combination in a pair of rolls of a groove and creasers, which will, by their joint operation, exert pressure in a lateral as well as a longitudinal direction. 2d, In combination with the above, dividing the rollers radially and vertically.

41. Tool for Crozing and Chamfering Barrels; H. Martin, Louisville, Kentucky.

Claim—The stock provided with the rollers, arranged so as to be capable of being adjusted longitudinally and laterally in the stock.

42. Apparatus for Increasing the Draft of Furnaces; J. B. Martin, Wilmington, North Carolina.

Claim—1st, The combination of a fan with the exhaust when arranged within the smoke-stack, so that the exhaust steam, as it issues from the exhaust pipe, acts directly on the blade of the fan, and then passes with the products of combustion in a direct path through the fan and through the smoke-stack, thus causing the fan to turn with high velocity, and thereby accelerating the draft of the furnace. 2d, The combination of the deflecting plates with the blades of the fan, for the purpose of intercepting sparks and cinders.

43. Sleeping Cars; T. E. McNeill, Philadelphia, Pennsylvania.

Claim—1st, Constructing the seat of the swing seat of a railway car with guiding strips, or their equivalents, and padded leaves hinged together and to the seat, so that the latter may be extended and form a comfortable couch for sleeping purposes. 2d, The frame arranged to receive the padded board, when the frame is hung to one end of the couch, and the board to the opposite end by rods, and when the whole is combined with the swing seat of a railway car, so as to form a rest for the back during the day, and a sleeping couch for the night.

44. Coffee Pots; C. A. Merchant and G. L. Patterson, Frankfort, Kentucky.

Claim—The combination and arrangement of the cylinder in the reservoir and the tubes, in the manner described.

45. Clover Pickers; Wm. T. Mills, Galesburgh, Michigan.

Claim—Providing the teeth with the holes and angular plate, when arranged at the front edge of the adjustable platform or box, and in relation to each other, in the manner described.

46. Discharging Water from Floating Dry-docks for Canals; Stephen F. Palmer, City of New York.

Claim—The manner of discharging the water from a floating dock by means of the underground trunk, in combination with the flexible apparatus to convey the water from the dock without interfering with its rise and fall. Not confining myself to any particular manner, provided it produces the same result of giving the water a self-acting discharge.

47. Variable Exhaust Pipe; Wm. P. Parrott and Stephen H. Head, Boston, Massachusetts.

Claim—The contracting orifice for blast pipes, in the manner set forth.

48. Variable Exhaust Pipe; Jones Patrick, Chicago, Illinois.

Claim—In combination with a revolving cylinder or plate of variable-sized exhaust openings, the rock shaft, pawl radius bar, and their several connexions, in the manner set forth.

49. Sash Supporter; John F. Peabody, Salem, Massachusetts.

Claim—My arrangement of the rack bar with reference not only to the groove of the window frame, but to the inner side of the sash and to the catch applied thereto, the rack-bar, under such arrangement, not only being in full view with the catch, at any altitude in which the window sash may be placed in the frame, but operating not only to support the sash at such altitude, but to maintain it within the groove.

50. Photographic Plate Vise; Sylvester W. and Washington L. Pearsall, City of New York.

Claim—The spring rocking jaw and lever, in combination with the movable jaw. Also, the jaw pieces or facings of hard rubber or gutta-percha, for the purposes specified. Also, the arrangement of the rod, stock, and gudgeon, entering the socket, and having the set-screw, by which the apparatus is retained in position horizontally.

51. Cotton Bale Hoops; G. W. Penniston, North Vernon, Indiana.

Claim—The tye or friction key, constructed with convex inner bearings, in the manner specified.

52. Harvesters; Sylvester Persons and Alfred W. Cone, Panama, New York.

Claim—1st, Arranging and operating the chain cutters upon an adjustable and vibrating cutter frame, in the manner described. 2d, The arrangement of two or more rollers relatively to the chain cutters, multiplying wheel, and adjustable vibrating cutter frame, so that the rollers will form a bearing for the chain cutters, and support and hold the chain in gear with the multiplying wheel, whatever may be the position of the adjustable vibrating cutter frame in passing over unlevel surfaces.

53. Fanning Mills; J. E. Rice, Oneida, New York.

Claim—The arrangement and combination of the suction chamber, spouts, plate, and shoe, as described.

54. Filtering Apparatus; Nathan F. Rice, New Orleans, Louisiana.

Claim—1st, Passing the water through the filtering medium from below upwards, in the manner specified. 2d, The concavo-convex perforated false bottom or diaphragm, constructed as described. 3d, The air tube leading from the lower chamber, as specified.

55. Fire and Ventilating Apparatus for Ships; John W. Richards, City of New York.

Claim—1st, Arranging and applying the pipes, or their equivalents, leading to the different parts of the vessel, in combination with suitable connexions with a boiler and a blower or air-forcing apparatus, that the said pipes may be used as required, to supply either air for ventilation or steam for the extinction of fire. 2d, Applying the several lengths of pipe in a train so that they are capable of being turned in their joint boxes or supports, for the purpose of giving such direction to the ventilating air supplied by each length, as the occupants of the berth or part of the vessel supplied by it may desire.

56. Ovens; Thomas Russell, City of New York.

Claim—The employment in an oven, in combination with permanent ways or tracks, arranged at right angles to each other within, without, and through the door-ways, and with a series of carriages to run on such ways, of a system of horizontal screws and endless chains, and of teeth, or their equivalents, on said carriages, to connect with said screws and chains. Also, the opening of the oven doors to admit and permit the exit of the carriages by the direct action of the doors of the carriages themselves, thereby dispensing with special machinery for that purpose.

57. Burr Stone Mills; Gelston Sanford, Poughkeepsie, New York.

Claim—1st, The mode of constructing the casing or shaft with a vertical or upright joint, in combination with the lever and edges as a fastener for the shell. 2d, The grinding part and the elevating part, in combination with the cone and shell, in the manner specified.

58. Hinge; Samuel S. Squire and Theodore Scharfenburg, Brooklyn, New York.

Claim—Providing the half leaves on one side of a butt with the hinge pins, which are sold with the pattern and form part thereof, when cast in the manner specified.

59. Dressing Mill-stones; Alfred Sheek, Smith Grove, North Carolina.

Claim—In combination with a plane surface land, the depression, and convex furrow or surface, in the manner described.

60. Rotary Steam Engine; H. B. Thomas, Portage City, Wisconsin.

Claim—1st, So constructing and combining a piston wheel and sliding pistons with two eccentric cylinders, one outside and the other inside the said wheel, that with a proper arrangement of induction and eduction passages, those parts of the pistons within the rim of the wheel, as well as those without, are rendered effective in the operation of the engine, and it is thereby rendered double-acting, either in its employment as a motor or as a pump, or as a combined motor and pump. 2d, The combined arrangement described, of the passages and cavities in the cylinder head, ring valve, and bonnet.

61. Sewing Machines; Wm. W. Wade, Longmeadow, Massachusetts.

Claim—The application to sewing machines of the ratchet or corrugated wheel and pawl, the pawl being kept in place by a friction cam, or its equivalent, and the motion being communicated to the machine, either by a double crank or by a single crank, or other appropriate means.

62. Machine for Grinding Saws; George Walker, Port Jervis, New York.

Claim—1st, The arrangement and combination of the wheel and bed-plate, whereby said driving wheel is made to drive the bed-plate, and also to compensate for the pressure of the grindstone. 2d, The flat-bottomed water recess in the face of the bed-plate, as shown.

[This invention consists in supporting saws during the operation of grinding them, upon a horizontal bed arranged below the grindstone, by which means the chattering of the saw, and consequent waviness of its surface are obviated, and the water used in grinding, and what is termed the "cut," viz: the particles of stone worn off in the grinding process, are prevented flying away from the place of grinding, and by that means the grinding process expedited. It also consists in suspending the grindstone above the saw bed in such a manner that as much of the weight of the grindstone, and no more than is desirable, may be allowed to bear on the saw, and the grindstone is made to bear heaviest on the thickest parts of the saw, and thus sooner grind it to a uniform thickness than when the saw is applied in the usual manner. It further consists in a certain method of applying the power to drive a rotating saw bed for grinding circular saws, that the driving gear serves to confine the bed to the grindstone, and prevent the bearings of the bed wearing out of plumb.]

63. Sizing for Colored Papers; Charles Williams, Philadelphia, Pennsylvania.

Claim—The employment or use, in a sizing for marbled and other colored papers, of the solution of the gum resin lac, in combination with a solution of either soap or bees-wax, or both, the said solutions being made and incorporated together in the sizing, in the manner described.

64. Cast Iron Pavement; Chapman Warner, City of New York.

Claim—The mode of constructing pavements of iron frames of any size, substantially of the form described, placed at right-angles to each other, each surmounted by a single boss, which constitutes the traveling surface, it being so arched and placed upon the frame, and the frames so connected with each other, that the pressure arising from a weight imposed upon any boss, or upon any part of it, shall not be borne exclusively by one part of the frames, but shall be diffused over it and over the adjoining frames, the manner of connexion at the same time preserving the regularity of the surface, by preventing the elevation or depression of any one boss above or below the surface of the others, the space left by the frames to be filled with any material which the circumstances of each particular case may determine.

65. Machine for Shaving the Heads of Screw Blanks; Awrin Wood, Worcester, Massachusetts.

Claim—The wheel with its volute and twisted slot, in combination with the ways, or the equivalent thereof, to present the blanks in order, by means of which combination the blanks are separated one by one, and gradually brought to a horizontal, or nearly horizontal, position. Also, in combination with the wheel, having a volute and twisted slot, for receiving the blanks one by one from the separating wheel. Also, the combination of the inclined ways, the separating wheel, with its volute and twisted slot, the feeding tube and punch rod, or the equivalent thereof, with the jaws on the mandrel. Also, communicating motion to the separating wheel by an interposed spring spur or catch, or the equivalent thereof, that the spring connexion between the impelling mechanism and the separating wheel, or its equivalent, may yield to any obstruction, and thus prevent injury to the mechanism.

66. Stereoscopic Apparatus; James Lee, Assignor to self and Milton Finkle, City of New York.

Claim—The fan or segment hinge, or its equivalent, in combination with the picture-holders, for the pur-

pose specified. Also, the controlling band, or equivalent. Also, the elastic band, or its equivalent, in combination with the pulley and rollers. Also, the picture-holder, as described. Finally, the combination as set forth and described, but do not confine myself to the exact proportions, as I may vary the same while I obtain the same end, by means essentially the same.

67. Meat Cleaver; Ezra Pollard, Albany, New York, Assignor to self and Joshua Gray, Westfield, Mass.

Claim—The meat masticator, in combination with the cleaver, substantially as specified.

68. Fly-trap; Reuben Shaler, Madison, Connecticut, Assignor to George W. Shaler, City of New York.

Claim—The combination of the stud and cover, when arranged in connexion with the chambers, as described.

69. Harness Saddle-trees; Samuel E. Tompkins and John Maclure, Assignors to Samuel E. Tompkins, Newark, New Jersey.

Claim—The tubular projection on the bow of the tree, so as to form a case for the bolt, and permit the securing of the wooden seat block to the tree, without injuring the same or allowing it to work loose, and at the same time securing the check-rein hook to the tree.

70. Machinery for Cutting Files; Milton D. Whipple, Charlestown, Massachusetts, Assignor to the Whipple File Company.

Claim—1st, The circular rolling cutter, operating in the manner set forth. 2d, Holding the face of the blank which is being cut, up to a face plate or rest by pressure upon its opposite sides. 3d, Clamping the blank rigidly, while a cut is being made, and releasing it preparatory to its being fed. 4th, The wedges operating as set forth, for the purpose of clamping the blanks. 5th, The sheld against which the blank rests, and which is fed up with the blank, in the manner set forth. 6th, The machine for cutting files, consisting essentially of the combination of the elements above claimed, and operating in the manner set forth.

FEBRUARY 8.

71. Machine for Making Rivets, Bullets, &c.; C. B. Allen, Philadelphia, Pennsylvania.

Claim—The revolving shaft with their inclined planes and former, and the mould wheels or formers attached thereto, in combination with the yoke and wheels, whereby the extremities of the shafts to which the mould wheels or formers are attached, are made to approximate and separate. Also, the bar and the inclined plane, in combination with the rod and cutter wheel, whereby the portion of metal which has been moulded or formed may, when so desired, be severed or detached.

72. Railroad Safety Switch; Giles S. Appleton, Burlington, Vermont.

Claim—1st, The combination of the broad and even switch rails with the broad and even traverse rails, long guide rails, and short lift and guide rails, when the same are arranged in relation to each other, substantially as described. 2d, Allowing the wheels to play upon the wide traverse and switch rails after leaving the short lift ways and guide rails, before they reach the main track.

73. Method of Opening and Closing Gates; J. A. Ayers, Hartford, Connecticut.

Claim—The counterpoised or loaded platform, formed of two parts, connected by joints or hinges, and placed in the carriage way beneath the gate, and extending a requisite distance at either side of it, when said platform is connected by suitable mechanism with the gate to operate said gate. Further, in connexion with the platform, the locking device formed of the drop bars, and the jointed levers connected with the bars, which are provided with the upright arms extending upward through the platform.

74. Sawing Machine; Benjamin Barker, Ellsworth, Maine.

Claim—1st, The saw-dust spout, arranged relatively with the edging saw and feed table, as set forth. 2d, The trimming saw, when used in connexion and arranged relatively with the edging saw to operate conjointly therewith, as described.

75. Earth Excavators; Joseph P. Barker, Wayne, Ohio.

Claim—The manner of arranging and adjusting the apron, and operating the same by means of the bent levers, for the purpose of conveniently discharging the earth taken up at any desired point, and used in connexion with the adjustable wheels.

76. Steam Ploughs; Samuel K. Bassett, Galesburgh, Illinios.

Claim—Having the wheels of the truck attached to separate axles with pivoted or swiveled inner bearings, the outer bearings of the axles being fitted in guides, and the outer ends of the axles being connected by rods with racks, into which pinions of shaft gear, the shafts being connected by the endless chains passing around cone pulleys placed in reverse positions on the shafts, being arranged to facilitate the guiding and turning of the machine.

77. Billiard Register; Henry J. Behrens, City of New York.

Claim—The use of numbers instead of balls—technically called "points"—so arranged and worked by mechanism that any number of points made by the player may be readily marked on the number itself, and the amount of the thus successively marked points is made to be shown by the register by mechanism.

78. Monumental Daguerreotype Cases; Jacob Bergstresser, Berrigsburgh, Pennsylvania.

Claim—The combination of the central frame encased by a central raised bead on the rear side of a glass plate, with the outer frame encased by an outer raised bead, the central frame and outer frame being cast together on the same glass plate, and the outer one being deeper than the inner or central frame.

79. Coffee Pots; E. H. Covell, City of New York.

Claim—1st, The combination of the chamber with the condensing chamber and condensing pipes. 2d, The combination of the condensing pipes with the steam pipe and trap, as described.

80. Application of Electricity in Dental Operations; Wm. G. A. Bonwill, Dover, Delaware.

Claim—In the application of electricity to dental purposes, the mode described of extracting or extirpating the dental pulp or internal nerve of teeth, to wit: by the application of a current of electricity through the instruments made use of in the performance of said operation, directly and constantly to the dental pulp or internal nerve, during the operation of cutting out or extracting the same.

81. Photography on Wood; Charles B. Boyle, Albany, New York, patented in England, Jan. 7, 1859.

Claim—1st, The described or substantially equivalent method of applying albuminous matter, and afterwards coagulating it by heat, so as to form an insoluble base within the pores of the wood. 2d, Taking pho-

tographic pictures upon wood, the pores of which have been filled with gelatine, or its equivalent, and subsequently removing the gelatine from the block without injury to the picture by the application of a warm solvent.

82. Machine for Riving Laths from the Block; J. L. Brown, Indianapolis, Indiana.

Claim—The combination and arrangement of the yoke, knife, plate, guides, with the pitmans, elbow levers, and rests, constructed as set forth.

83. Manufacture of Rubber Hose Pipes; John H. Cheever, Boston, Massachusetts.

Claim—The new article of manufacture, consisting of hose or pipe made of fibrous rubber by powerful pressure, and without seams or joints, as described.

84. Harvesters; George E. Chenoweth, Baltimore, Maryland.

Claim—The combination of the cam cylinder with the cross arm, slide bar, and slotted or jaw lever, constructed in the manner specified. Also, a slide bar having two cross arms provided with friction rollers, and working in the slotted box.

85. Valve Bung; Florian Dahis, Williamsburgh, New York.

Claim—A bung provided with an air passage terminating in a recess or chamber, in which a disk valve of rubber, or other suitable material, is placed, and secured therein by a plate provided with a hole, specifically as set forth.

86. Washing Machine; Beriah Douglas, Appleton, Wisconsin.

Claim—The washing seat and the foot box as combined with the washing rocker and the hand supporters, and the clothes holder or wringer as combined with the washing tub.

87. Cultivators; James Dundas, Little Rock, Illinois.

Claim—The arrangement of the half shovels in connexion with the bar, to be moved to the right or left at the pleasure of the operator.

88. Cultivators; George Essington, Plainfield, Illinois.

Claim—The arrangement of the mould-boards and centre-piece, in combination with the coulter or standard, point, and shares, constructed as described.

89. Furnace for Smelting Iron; Squire M. Fales, Baltimore, Maryland.

Claim—The combination with the ordinary furnace of the arched chambers or recesses at the sides of the furnace, the opening in the crown of the arched recess or chamber, and the movable tymp at the external openings of the arched chambers or recesses, as specified.

90. Cattle Pumps; Daniel P. Farnham, Johnstown Centre, Wisconsin.

Claim—1st, The combination of the lever and rod, or their equivalents, with the gate and inclined platform, arranged as described. 2d, The strips of metal secured on the inside of the barrel of the pump, to prevent the valves from coming in contact with the plunger as it works up and down, in combination with the barrel. 3d, The packing ring, constructed as described, and kept up to the plunger by weights on the back side.

91. Mortising Chisel; J. B. Fisher, Beaver Dam, Wisconsin.

Claim—Constructing the tool with two cutting edges or portions of different lengths, as described.

92. Manufacture of Cast Steel; Perry G. Gardiner, City of New York.

Claim—It is not simply the gradual and prolonged cooling of the metal after melting, as aforesaid—but the process as a whole of pouring the melted metal into intensely heated moulds, and then placing them, thus filled, immediately into the heated oven or furnace where they congeal, away from the external atmosphere, down to a cherry red heat, and then immediately plunging the ingots or bars into the highly heated oil, and retaining them immersed in it for a considerable time, as described.

93. Manufacturing Tools from Cast Steel; Perry G. Gardiner, City of New York.

Claim—The process of treatment of the cast steel, by pouring it in a molten state into moulds of the shape and size required for tools, instruments, axes, &c., previously heated to a high degree of heat, the steel being melted in a closed oven or furnace, and then replacing the moulds so filled in an oven or furnace, away from the external air, and keeping them there until they have been cooled down to a cherry red heat, and then immersing the tools, axes, &c., into the fluid mixture of a temperature of from 100° to 150° Fah., as described.

94. Gun Lock; J. A. Lowe, City of New York.

Claim—The rule joint, or its equivalent, in the link, as described.

95. Mail Bag Fastening; John C. Garland, Chicago, Illinois.

Claim—The employment of a slotted sliding strap, when made of a single steel spring, and used in combination with a series of narrow stationary iron guides, attached to the perforated flap of the bag, and with a steel spring having headed stop pins fitted between the front portion of the binding and the upper edge of the mail bag.

96. Rotary Spading Machines; George W. B. Gedney, City of New York.

Claim—A series of spades which are operated so as to descend edgewise into the soil successively in each others track, and then to move laterally to detach the slice of soil upon which they operate from the undisturbed land. Also, combining an endless series of spades, operating with a cam, or its equivalent, that controls their positions by means of spade handles, or their equivalents, that are connected with the blades of the spades. Also, adapting the machine to be moved either end forward, by constructing the device that imparts lateral movement to the spades in such manner that its position may be changed, and that it may be made fast in either position.

97. Skirt Hoops; James C. Gilbert, Winthrop, Maryland.

Claim—In connexion with the movable spools and springs placed or strung on the cord, a series of stationary abutment blocks fastened at intervals to the cord, and operating in manner specified.

98. Padlocks; John A. Goewey, Albany, New York.

Claim—The combination of the tumbler having attached to it the spring, with the tumbler having attached to it the stump, when arranged in the manner set forth.

99. Arms of Broadcast Seeding Machines; Henry J. Hale, Indianapolis, Indiana.

Claim—The combination and arrangement of the segments and hinge, constructed as set forth.

100. REFRIGERATOR; Samuel Hickok, Buffalo, New York.

Claim—The combination of the tube arranged with the tank, when combined with the case, as described.

101. DOOR LOCK; Joseph S. Hoard and Valorus O. Spencer, Mansfield, Pennsylvania.

Claim—1st, The combination of the key with the flanch and plate, by which the key is made to operate as a detent to prevent the return of the plate, which covers the outer key-hole. 2d, The combination of the stop upon the bolt with the key, in such a manner that when the key is in the position represented, the stop will strike against the key and prevent the return of the bolt. 3d, The stop on the flanch, when combined with the key, in the manner described, to prevent said key from being turned too far.

102. SOLE-CUTTING MACHINES; A. P. Howard and Allen Rowe, Jr., Stoneham, Massachusetts.

Claim—Arranging the sole-cutter on the lower end of, and at right angles to, a vertical shaft, and combining with such mechanism not only for elevating and depressing such shaft in line of its axis, but mechanism for producing successive semi-rotations of such shaft and cutter, the same operating so as to carry the sole-cutter toward and away from the bed, and to give to such cutter an intermittent rotary motion. And in combination with the mechanism for elevating and depressing the cutter, and that for rotating it under an arrangement of the said cutter, with respect to its shaft, we claim the guide tooth and the clutch recesses, arranged to operate in manner set forth. Also, the combination and arrangement of the concave sole-discharger and the convex sole former or bender with the cutter, and so as to operate together in manner specified.

103. DOOR SPRINGS; G. L. Hudson, Conneaut, Ohio.

Claim—The use of the standard, coil spring, stirrup, crotch lever connected with rod, link as operating vice-versa to gate or door, arranged or connected in the manner set forth.

104. LADIES' HOOP SKIRTS; Frederick Hull, Derby, Connecticut.

Claim—The combination of the sloping bustle springs, with the waist-band adjustable at the back and front, whereby the adjustment of the bustle is effected by the waistband alone.

105. SURVEYING INSTRUMENTS FOR DETERMINING INACCESSIBLE HEIGHTS AND DISTANCES; Marshall Angersoll, Grafton, Ohio.

Claim—The construction of a surveying instrument for taking distances and altitudes upon the general principle set forth. Especially, the arrangement of the three sights, or their telescopic equivalents, one of which is adjustable upon a scale, by which means and the adjustment of a target having the same horizontal scale, the distance of any object within the range of vision can be determined. In this claim I do not intend to confine myself to the precise arrangement set forth, but to use a telescope in which a similar adjustment of hair sights (or filaments of silk) are provided for upon a definite scale; neither do I intend to confine myself to any particular scale, but to adopt a decimal scale, or any other that I may see fit. I claim, especially, a horizontal target, having marked upon it a scale corresponding to that of the accompanying instrument, which target is to be used in connexion therewith. Further, the scale of altitude, in combination with the scale of distance to be used, in the manner specified.

106. DEEP SEA SOUNDING APPARATUS; Augustus Jonan, San Francisco, California.

Claim—The combination and arrangement of the several essential devices described, operating in the manner set forth.

107. METHOD OF VARNISHING AND PROTECTING SURFACES; Frederic Kuhlman, Paris, France.

Claim—1st, The process described of fixing the surfaces of fabrics (fibrous or textile,) or solid surfaces, as walls or masonry, by the application of a weak solution of an alkaline silicate, as the silicate of potash and soda, to said paint basis. 2d, For a similar purpose, the method described of laying a coating of artificial leather over the surface of the basis pigment. 3d, The described method of fixing and rendering printed papers and fabrics water-proof, and fixing the same by hot calendering. 4th, The described method of rendering the surface of plaster of Paris water-proof, and of preserving the same, by forming a coating of artificial sulphate of baryta upon said surface.

108. CHURN; Rufus Lapham and R. P. Wilson, City of New York.

Claim—The use of an exhausting or condensing pump, in connexion with the cream reservoir, for the purpose of forcing air upon the upper surface of the cream, or withdrawing it from it, in the manner described.

109. WATER WHEEL; C. V. Littlepage, Austin, Texas.

Claim—The wheel provided with curved buckets and attached to the shaft stepped in the block, and otherwise arranged as shown, in connexion with the spiral water passage in the block or bed.

110. MACHINE FOR RIVING STAVES FROM THE BLOCK; L. Lyman, James P. Hodgkins, and E. Rawson, Carthage, New York.

Claim—1st, Having the tubes of the rods or gauges fitted in blocks, which are adjusted by the screws, or their equivalent. 2d, Placing the rods or gauges in tubes in the lower end of which springs are placed, and on which springs the rods rest, for the purpose set forth.

111. ALARM CLOCKS; J. F. Mascher, Philadelphia, Pennsylvania.

Claim—The application of the rack, pinion, and snail, in the manner set forth, to the going part of a clock or watch, for the use and purpose described.

112. PADDLE WHEEL; John May, Columbus, Georgia.

Claim—So applying and arranging a frame outside of the wheel, and in combination with the axle or centre on which the floats rotate, or its equivalent, that the said frame may be turned about the wheel, and by being so turned will change the position of the said axle or centre, or its equivalent, relatively to the centre of the drum, and thereby cause the floats to be projected from the drum, in such positions relatively to the axis thereof, as may be desired.

113. HARVESTERS; Wm. K. Miller, Canton, Ohio.

Claim—The combination of the braces and rocking bar, as set forth. Also, the adjustable hinge plate, for the purpose described. And, finally, the combination of the shoe hinge plate, braces, and rocking bar, in the manner described.

114. STOVES; N. W. Northup, Greene, New York.

Claim—In a stove, constructed as described, the combination and arrangement of the partition with the flues and dampers, in manner specified.

115. SOOT AND SPARK ARRESTER; Washington Abram Peaslee, Indianapolis, Indiana.

Claim—The combination and arrangement of the cap, rod, walls, G F and Q, with the case or outer wall, C, flues, and wall, D, constructed in the manner set forth.

116. Device for Preventing Tremulous Vibration of Saw Gates; David Reynolds, Ogden, Indiana.

Claim—Combining the guide bar and boxing with the sash saw and fender posts, as described.

117. The Process of Manufacturing Caustic Alkalies; Henry Pemberton, East Tarentum, Pennsylvania.

Claim—The mode described of separating the solution of caustic soda, or other caustic alkaline liquid, from an insoluble precipitate, by the use of a filter, constructed in the manner described.

118. Heel and Spoke Shaves; Joseph A. Perley, Lynn, Massachusetts.

Claim—The combination and arrangement of the adjustable gauge and beveled shanks, so that the gauge may be moved in a plane but slightly inclined to the convex side of the knife toward the edge or from it.

119. Carpet-sweeper; N. B. Pratt, Deep River, Connecticut.

Claim—The arrangement of the bearings of the friction driving rollers in oblong slots of the box, and the rollers, in the specified relation to the ends of the revolving broom or brush.

120. Manufacture of Cheese; T. A. Redington and G. McCluer, Fredonia, New York.

Claim—The combination of the water-box, milk vat, the reserve water-box, boiler, pipes, and the six-way cocks, arranged to operate as set forth.

121. Machines for Stretching Leather; Albert W. Roberts, Hartford, Connecticut.

Claim—The constructing of the jaws of leather-stretchers with ways for the wedges to slide on, that the wedges may be so relieved from the leather when drawn back, that the leather can be put in without removing the wedge from the jaw. Also, making the frames of hollow tubes on which the jaws slide, and also the application of steam to said frames, for drying purposes. Also, the shaft and gears for throwing back the wedge.

122. Corn Huskers; Wm. N. Rowe, Sharpsburgh, Maryland.

Claim—The combination of the adjustable plate armed with spikes, with the endless apron and knives, constructed in the manner described.

123. Skates; N. C. Sanford, Meriden, Connecticut.

Claim—Attaching the runner of the skate to its stock by means of the springs, as set forth.

124. Cast Iron Pavement; S. T. Savage, Albany, New York.

Claim—Combining the blocks by the peculiarly arranged dovetails cast on the blocks, and the locking pieces composed of heads and feet fitting between the blocks and into their dovetails, as described.

125. Refrigerator; Wm. Sims, Dayton, Ohio.

Claim—The described arrangement of the ventilating passages communicating with the upper part of a receptacle, in the lower part of which are placed ice and articles to be cooled or preserved, and in whose lower part circulation of air is avoided, in the manner set forth.

126. Corn Shellers; J. P. Smith, Hummelstown, Pennsylvania.

Claim—The arrangement of the groups of short teeth, alternating with the smooth spaces, which are provided with the raised ribs, in combination with the sharp-edged teeth (with curved or straight edges), when arranged circularly in lines parallel with the axis of the wheel, and operating in connexion with the ear-holder, so as to act on the ears of corn nearly lengthwise thereof.

127. Regulating the Twist in Throstle Frames; Joel Smith, Northbridge, Massachusetts.

Claim—The expanding pulley, arranged to operate as described.

128. Grain Weighers; John B. Stoner, Bennington, Illinois.

Claim—1st, The rotary hopper, constructed as described. 2d, Suspending the rotary hopper upon the lever or scale arms, as set forth. 3d, The arrangement of means described, for operating and controlling the valve or door to the shute of the stationary hopper. 4th, Operating the indicators by means deriving their motions from the weighted end of the scale arms, in combination with the springs, or their equivalents. 5th, In combination with the suspending of the rotating hopper, the suspending of the weight, as described.

129. Sluice for Water Wheels; John Temple, Assignor to Temple, Mills & Stout, Middletown, Ohio.

Claim—The winged gates, arranged in combination with a series of scroll shutes, in the manner set forth.

130. Water Wheels; John Temple, Assignor to Temple, Mills & Stout, Middletown, Ohio.

Claim—The construction and arrangement in central discharge water wheels of buckets, which have the described compound cyma-reversa and downward and outward curve, whereby the water acts on the wheel by percussion, reaction, and gravitation, and escapes freely without back action.

131. Machine for Tenoning Spokes; Webster Thomas, Oxford, Ohio.

Claim—The combination of the beds, constructed with support piece, wedge, and the double series of cutters, in the same cutter bearer, the construction and operation being as described.

132. Revolving Fire Arms; John Walch, City of New York.

Claim—The revolving chambers or breeches, fitted with two ranges of nipples, and firing the respective charges in succession.

133. Lasts; Daniel M. True, Rockland, Maine.

Claim—As a fastening for last blocks, the bolt, when formed with the notches, and combined and arranged with the spring, the pin, and last hook hole.

134. Underground Grain Ploughs; Augustus Watson, Walnut Run, Ohio.

Claim—So hanging a coulter to which a mole is attached, as that by revolving a key, or its equivalent, that restrains said coulter, and by advancing the plough, said coulter and mole will run out of the ground.

135. Apparatus for Supplying Hydro-carbon with Oxygen; A. H. Webster, Hudson, New York.

Claim—The bellows actuated by the tappit wheels and attached to the chest, provided with a cover or weight and an eduction opening, combined and arranged as set forth.

136. Bee-hives; Wm. L. West, Elmira, New York.

Claim—The use of the opposing springs for the purpose of insuring a contact of the parts contiguous to the passage way, as described.

137. Apparatus for Drawing Water; Sylvanus A. Wheat, Franklin, New York.

Claim—Giving the barrel a longitudinal motion on the shaft, also connecting the valve to the rope by the rod.

138. Ellipsograph; Thomas Williams and Wm. C. Joslin, Fisherville, Connecticut.

Claim—The slotted bar, A, provided with the slide. the arbor passing through the slide, with the disk and slotted bar, D, attached, and the elastic bar, G, pivoted to the bar, A, and connected eccentrically with the disk, the bar, D, having the pencil stock attached, arranged as set forth.

139. Burglars' Alarm; John P. Wilson, Frankfort, and John F. Thomas, Ilion, New York.

Claim—1st, The employment in connexion with the described gun alarm, of an adjustable gimlet screw, which is secured in a dovetailed groove in the body while in use, and which is secured in the barrel or bore by a screw when not in use. 2d, The employment of the two sides between which the hammer falls, which serve to prevent particles of the cap from flying off, and at the same time forming a snug protection for the hammer, and causing a louder report of the cap.

140. Odometre; Thomas K. Work, Hartford, Connecticut.

Claim—The curved or segment weight pivoted to the arm, which is attached to the pinion, and fitted between the annular ledges, as set forth.

141 Instrument for Taking Altitudes of the Sun; Frederick Yeiser, Lexington, Kentucky.

Claim—The arrangement of the spirally slotted cylinder on a rotary frame, in such relation to a pin and to a strongly defined line, that it operates as specified. And in combination with the rotary frame, operating the cylinder by means of a toothed sector which gears into cogs, which are attached to the stationary disk, in the manner described.

142. Mechanism for Stopping Watches; John K. Bigelow, Assignor to Appleton, Tracy & Co., Waltham, Massachusetts.

Claim—The peculiar mode of making the ratchet, viz: with trapezoidal teeth, and with a notch in each of them. Also, the arrangement or application of the stop-lever with respect to the stopping stud and the ratchet, or so as to serve not only as a carrier and actuator of the former, but as a stop to the latter under circumstances as specified.

143. Seed Drills; Michael Boyer, Assignor to Charles S. Rohner and Wm. Gunckel, Germantown, Ohio.

Claim—Arranging the spring, ratchet wheel, ratchet, link, drag bar, arm, and discharge spout, in the manner specified.

144. Steam Condensers; John N. Dennison, Assignor to self, Joseph Dennison, and David Baker, Newark, New Jersey.

Claim—A feed-pump with its attachments and connexions, in combination with a condenser, arranged as set forth.

145. Stump Extractors; E. B. Hall, Woodbury, Assignor to self and Joseph C. Farley, Pine Grove, N. J.

Claim—As an improvement on the patent of J. S. Wood. the cam, when constructed in the peculiar manner described, in combination with the rods and their rejective rollers and hooks, arranged in respect to each other for joint action, as set forth.

146. Dies for Cutting Screws; Peter Hoffman, Rising Sun, Assignor to self and Samuel F. Covington, Indianapolis, Indiana.

Claim—The construction of a solid die, in which the bottom of the groove is so thrown up in the rear of the cutting point or edge of the same, as to avoid the friction occasioned by the rubbing upon the top of the thread, of the bolt cut or threaded.

147. Knife-sharpener; George Himman, Assignor to self and Charles Monson, New Haven, Connecticut.

Claim—The use of the two cutters when made susceptible of being adjusted to any desired angle, by means of a slot while using any portion of the length of the cutting edges. Also, the rest, in combination with the adjustable cutters, when the whole is constructed and fitted for use, as described.

148. Self-acting Cheese Press; William Leach, Clarkson, Assignor to self and George P. Tisdale, Chili, New York.

Claim —The pitman, arranged in combination with the pairs of cross-levers, so as to keep said cross-levers at equal heights at opposite ends of the press, and consequently at the same relative angle to the table in all positions, for the purpose of securing uniformity of pressure upon all parts of the articles pressed. Also, the combination of the rod, handle, and pawls, mounted in one pair of cross-levers, with the notches, or their equivalents, in the other pair of cross-levers, arranged in the manner set forth.

149. Moulding Paraffine Candles; Horatio Leonard, Assignor to self and H. Ryder, New Bedford, Mass.

Claim—The process involving the employment of a heated mould, and water and air-baths at temperatures, and in the manner mentioned.

150. Method of Covering with Fibrous Material Submerged Spiral Electrodes for Short Distances; Edward Maynard, Assignor to self, N. K. Slaughter, and Thomas E. Purdy, Brooklyn, New York.

Claim—Constructing submarine telegraph cables of metallic conductors, twisted in helical form, in combination with layers of cords or strings, parallel, or nearly so, with the axis of the cable, that are confined together, by serving or winding, and are saturated with water-proof non-conducting material, as set forth.

151. Boot-jack; L. J. Wicks, Assignor to self and T. Burbeck, Racine, Wisconsin.

Claim—The described boot-jack, with the tools formed on the rear or front of its arms, said arms being made to open or shut together, in the manner specified.

FEBRUARY 15.

152. Bee-hives; George C. Aiken, Nashua, New Hampshire.

Claim—The arrangement of the boxes in the hive, so as to form, with the case thereof, the auxiliary or bell glass chambers, as described.

153. Treatment of Hides and Skins; Joseph Armstrong, Woburn, Massachusetts.

Claim—In combination with the application and use of a press, in connexion with the impregnation of

the hide with grease by a peg-lined cylinder, or any equivalent means, the employment of scraps of hide or other suitable absorbents, in the press, and against the edges and other necessary parts of the hides, and so as, during the operation of the press, to absorb the liquor from such edge or parts on or in which it would be likely to remain.

154. Arrangement of the Feed Roller in Wood-planing Machines; H. H. Baker, New Market, N. J.

Claim—Arranging the feed roller with a vibrating shaft, box, slide, spring, and with necessary gearing, so that said roller may be kept to the work or moved out free from it without stopping the working or running parts of the machine.

155. Hydrants; Frederick H. Bartholomew, City of New York.

Claim—1st, The combination of the valve with the main valve and its fixed valve seat, arranged as described. 2d, The arrangement of chamber within the trunk of the hydrant surrounding the seat of the main valve, having a waste passage at the bottom. 3d, The arrangement of the waste passage. the waste plug, and rod, in combination.

156. Mole Plough; Moses Bales, Big Plain, Ohio.

Claim—The adjustable mole ploughs upon a cutting shaft, arranged as set forth.

157. Reefing and Furling Sails; Charles E. Bishop, Brooklyn, New York.

Claim—1st, The employment of supplementary sheets to the topsails, and other upper square sails of a vessel, in order that said sails may be kept more "flat," and that the strain upon the ends of the yard may be lessened. 2d, Constructing topsails with supplementary sheets, clew-lines, and leech ropes, and with a central tackle, by the employment of which in due order, the topsail may be reduced and secured in successive portions.

158. Carpet-stretcher; Isaac W. Bragg, Cincinnati, Ohio.

Claim—1st, The dog, operating to attach the stretcher to that part of the floor next the wall, toward which the carpet is to be stretched. 2d, The combination and arrangement of the trip-lever for disengaging the dog. 3d, The combination and arrangement of the apron, feet, and slides, operating in combination with the rake to prevent the teeth from grazing the floor. 4th, The combination and arrangement of the stock, dog, driver, and actuating worm.

159. Method of Operating Yielding Feed Rollers; Joseph H. Brinton, Westchester, Pennsylvania.

Claim—A pair of feed rolls, one of which is yielding, and both driven by the same screw shaft, and in gear with it at all times.

160. Skates; Thomas W. Brown, Boston, Massachusetts.

Claim—The rocker and angular heel or straight edge runner, and applied to the bearing plates, or their equivalent, so as to be capable of being reversed with respect to the same, and used with either edge downward, as may be desirable. Also, the application of the heel plate to the heel screw, so as to be adjustable on, or with reference thereto.

161. Stoves; James D. Bruner, Alton, Illinois.

Claim—1st, Connecting and arranging with an oven which has no bottom, and between which and the passages of the products of combustion there is no communication, and the fire-box of the stove, air chambers, or cells. 2d, Combining with a detachable grate surface the detachable air cells or chambers.

162. Instruments for Threading Needles; S. S. Burlingame, Warwick, Rhode Island.

Claim—The needle-threader, consisting of an internally-barbed elastic pronged fork.

163. Cultivator Teeth; Wm. P. and Theodore H. Ford, Concord, New Hampshire.

Claim—The cultivator teeth, formed substantially as specified.

164. Cut-off Valves for Steam Engines; Adam Scott Cameron, City of New York.

Claim—The employment of the trip hinged valves, with their hook rods and appendages for operating them, or the equivalents thereof, in combination with the slide valve for cutting off the steam in steam engines. Also, in combination with the slide and the trip hinged valve, the so forming the seat of the slide valve relatively to the steam passages in the slide valve, as to admit the steam to the under face of the hinged valve and balance the pressure before they are opened. Also, in combination with the slide and trip hinge valves, the employment of the adjustable cone, or its equivalent, to regulate the period of cutting off the steam. Also, the cone, or its equivalent, in combination with the eccentric tube, or its equivalent, as a means of adjusting the relative periods of closing the two valves, as set forth.

165. Harvesters; Daniel Clow, Janesville, Wisconsin.

Claim—Constructing the main supporting wheel thereof, in such a manner as to form therein an outer and an inner zigzag groove; but this I only claim when the said grooves have differently proportioned reaches, and bear such a relation to the T-headed sliding bar, and the other parts of the machine which are connected with said bar and with the cutting apparatus, that the number of the movements imparted to the cutter bar can be varied at pleasure by shifting the bearings of the said sliding bar, from one position to another.

166. Hames; Henry Cogswell, Greenwich, New York.

Claim—The application of the shifting slide to hames as they are now used, by means of which slide the point and position of the draft of the hames can be altered as desired.

167. Pen-holder; Benjamin Cole, Brooklyn, New York.

Claim—The construction of a pen-holder with three or more elastic shanks or fingers, so arranged that the spring of said fingers will hold the pen by pressing it against and under the shoulders of two lateral fingers, and thus admit the introduction of, and be adapted to, pens of any ordinary size or thickness.

168. Fire-proof Floors; John B. Connell, City of New York.

Claim—Constructing a fire-proof foundation upon a series of wooden girders, for the reception of a flooring surface formed of boards, or other suitable materials.

169. Breech-loading Fire Arm; Frederick Curtis, Saugus Centre, Massachusetts.

Claim—When a breech slide is used in connexion with the barrel of a fire arm, a movable breech, separate from the breech slide, and arranged and applied therein, so as to be adjustable to the rear end of the barrel. Also, the arrangement of the priming nipple and the touch-hole thereof, with respect to the movable adjustable breech applied to the breech slide, as specified, or with respect to the same, and a primer arranged in the stock, such arrangement being productive of advantages, as before-mentioned.

170. Railroad Car Springs; Augustus B. Davis, Philadelphia, Pennsylvania.

Claim—A spring composed of a box or casing, with a lid attached to the same by means of a bolt or bolts, the said box containing a number of spiral springs confined longitudinally between the bottom of the box and the lid, and retained in their proper position laterally by means of lugs, or other suitable devices, the said lid having a limited movement in the direction of the springs, but having no lateral movement independent of the box, so that each spiral spring may be independent of the other, although the whole act in combination, the entire spring thereby retaining its elasticity, even should one or more of its spiral springs be broken or damaged.

171. Shoe Lasts; John C. F. Deecken, City of New York.

Claim—The endless chain or band, in combination with a knife or knives, operated in the manner described.

172. Umbrella Fastenings; Charles DeSaxe, City of New York.

Claim—The arrangement of the bolt, operating without springs, and by a double or sliding and rotating motion, in combination with the tubes or sockets, for the purposes set forth.

173. Mode of Squeezing and Straightening Tobacco; Martin D. Elsom, Howardsville, Virginia.

Claim—Squeezing and straightening bundles of tobacco, with a view of their being afterwards "struck" by passing them through a straightening and compressing mechanism.

174. Churn; John U. Fiester, Winchester, Ohio.

Claim—The adjustable dasher, constructed with two blades, yoke spring, cross-tie, with slots and pins, together with holes and air cavities, operating as described.

175. Wrench; Daniel P. Foster, Shelburne Falls, Massachusetts.

Claim—Making the hinge joint between the stationary and movable jaw of the wrench at a, viz: by the projections on the stationary jaw, and the depression in the washer that is on the shank of the movable jaw, for the purpose of allowing the movable jaw to change its position in relation to the stationary one, as set forth.

176. Shackle of Telegraph Cables, &c.; George Gilmour, Chelsea, Massachusetts.

Claim—The telegraph cable or rope shackle, as constructed, with one or more jaws, and mechanism to operate the same. Also, combining either the wing or the knife, or both, with the shackle, so as to operate therewith in manner specified.

177. Cork-cutting Machine; George Hammer, Philadelphia, Pennsylvania.

Claim—The described arrangement of guiding rollers and sliding wedge, or their equivalents, in combination with the stop, constructed in the manner set forth.

178. Horse Power Equalizer; Gorges Hely, Laporte, Indiana.

Claim—1st, Connecting the eveners by a rope or chain that passes over a pulley at the centre of the shaft. 2d, In combination with the eveners, the method of connecting the points or parts to which the horses are hitched, and by which they draw, by means of a system of ropes or chains and pulleys connected with the draft bars.

179. Rotary Engine; Samuel Huse, Chicago, Illinois.

Claim—The cams with their steam and exhaust ports, in combination with the heads, pistons, and cylinder, operating in the manner set forth.

180. Method of Lighting Gas by Galvanic Electricity; W. W. Hopkins, Amelia, Ohio.

Claim—The arrangement and combination of the hollow permanent magnet, valve chamber, coil, electro-magnetic valve, and tube, as described.

[A gas burner is combined with an electro-magnetic seat in this invention, to control the letting-on and shutting-off the gas; and there is also a certain arrangement of the conducting wires of an electric circuit in which the electro-magnetic valve is placed, by which a piece of platinum constituting a part of the same circuit, and occupying a position over the burner, is caused to be heated by the same action by which the valve is opened, and so ignite the gas.]

181. Harvesters; Moses G. Hubbard, Penn Yan, New York.

Claim—Connecting the cutting apparatus with the machine by an adjustable attachment, which can be changed from a free hinge to a joint, rigid in one direction, or in both directions, for the purposes set forth. Also, the employment of a raising lever of the second order with a gradually increasing purchase, by which it is made self-sustaining. Also, keeping the lever in a convenient position for operation by the hand of a driver, by means of a spring.

182. Elevator for Window Sashes; Wm. Huey, Christiana, Pennsylvania.

Claim—The arrangement and combination of the rods, pawls, ratchets, loose drums, sliding shaft, pins, and cords, as described.

183. Apparatus for Compressing Elastic Fluids; John Jameson, Gateshead, County of Durham, England; patented in England, March 13, 1858.

Claim—The compression and expansion of aeriform fluids by an apparatus of the nature described, the same consisting of a combination and arrangement of a series of cylinders or vessels, perforated or tubular pistons, induction and connecting pipes, valves, a reservoir, a rotary shaft, and means of heating, or heating and cooling, the cylinders or vessels, in the manner described.

184. Tape Primer for Fire Arms; Theodore T. S. Laidley, U. S. Army.

Claim—The combination of two different materials in the manufacture of tape primers, one a metal, or like substance, to receive and protect the percussion powder, into which it can be firmly pressed, and the other to connect the former into a series, something that can be easily severed by the edge of the hammer.

185. Adjustable Sight for Fire Arms; Richard S. Lawrence, Hartford, Connecticut.

Claim—The application of said hinge joint to the spring base and elevator, constructed and arranged as described.

186. Burglar Alarm; G. A. Lilliendahl, City of New York.

Claim—The arrangement of the slide and plate with the lips, so that a cartridge placed on the slide and between the two lips is exploded by pushing the slide in.

187. Railroad Signal Lanterns; S N. Lennon, Deposit, New York.

Claim—Suspending within the lantern, at two opposite sides. and over or behind the colorless glass plates, the frames, provided with the colored glass plates, and arranged as set forth.

188. Sewing Machines; Clark Marsh, New Milford, Connecticut.

Claim—The ring gauge with the pins. spring, and cam, or their equivalents, constructed and applied in combination with the slide ring, as set forth.

189. Preserve Cans; James F. Martin and Henry C. Nicholson, Mount Washington, Ohio.

Claim—A fruit or provision can, to be hermetically sealed. constructed of metal, lined on the inside with a vitrious enamel, capable of withstanding the action of the acids contained in the fruits, &c , to be preserved. Also, the combination of a metallic cover, vitriously enameled on the inside, with a fruit or provision can.

190. Stoves; David N. Martin, Lawrence, Massachusetts.

Claim—The arrangement of the air register at the upper part of the ascending discharge flue. and with respect to the direct damper, the ascending discharge flue being arranged between the two descending flues of the stove case.

191. Wind-mills; John M. May, Janesville, Wisconsin.

Claim—1st, A standard, arranged in the head of the frame work, and so constructed that it serves as a guide for the central vertical shaft, receptacle for gear, E, or gear, E′, or gear, E2, support and axis for the horizontal axle or shaft of the wind-wheel, and as a guide for the sliding thimble. 2d, Furnishing each of the stems of the sails with a cogged segment, for the purpose of revolving the sails on their radial axes. the segments being operated by cogged rack bars attached to the sliding thimble. 3d, The arrangement consisting of the main governor and the forked adjusting rod, connected with each other, for the purpose of operating the thimble in regulating or controlling the wind-wheel. 4th, Providing each of the stems of the sails with a weighted arm projecting forward of the front surface of the sails, for the purpose of governing the velocity of the wind-wheel by regulating the obliquity of the sails to the wind current. 5th, The covering made in two sections, which are constructed and arranged as shown, the tubular section revolving with the wind-wheel independently of section S, when the wind-wheel moves in the path of a vertical circle, and with it when the wind-wheel moves in a path of a horizontal circle.

192. Wind-mills; John M. May, Janesville, Wisconsin.

Claim—1st, The peculiarly constructed stationary, central, vertical shaft, in combination with the peculiarly constructed revolving tubular shaft or hollow column, the shaft providing axes for the wind-wheel, and the tubular column to revolve upon in the paths of horizontal circles, and serving as a support and guide of the structure of the wind-wheel, and the tubular column, serving for receiving the power of the wind-wheel and transmitting it to machinery. 2d, Enlarging the axle at its shoulder in the form of a hub or pipe-box, that the axis of the shaft may pass up directly through it, so that the centre of the axis of the shaft and axle intersect, and in themselves form vertical and horizontal centre bearings within the angle formed by the gear wheels, and the shaft and axle also serve as bearings for the gear wheels. 3d, The combination of a horizontal lever, the vertical governing rod or bar, guide bar, and thimble, ou the tubular column. 4th, The employment of a revolving conical cover, for the purposes of protecting the mechanism of the wind-wheel, and dividing the wind current at the front and centre of the wind-wheel head, and guiding it upon the sails, and relieving the weighted elbow levers used for revolving the sails on their radial axis of the countervailing influence of the wind current, so as to enable them to act by centrifugal force with certainty in governing the velocity of the wind-wheel.

193. Cracker Machine; John McCollum, City of New York.

Claim—1st, In combination with the carrying apron, the roller, with its doffer, or the equivalent thereof, and the supporting or feed roller. and supporting table, or their substantial equivalents, in the combination the rollers and apron moving with simultaneous, intermittent, progressive motion. the whole being so arranged and operated as to progressively make flat pellets of dough suitable for crackers, ship biscuit, and similar articles, placed in proper order upon the apron, and at suitable distances from each other to permit of the extension of diameter resulting from the operation, as they pass under the roller, without materially disturbing the order of their arrangement on the apron. 2d, The reciprocating docker, in combination with the carrying apron, bed, and stationary perforated clearer plate, and with or without adjustable springs in combination therewith, to make yielding pressure at the docking point. 3d, The flatting apparatus, as set forth in the first claim, when combined with, or used in combination with, a docking apparatus, such as is set forth in the second claim, or the substantial equivalent thereof, when used, combined. and operated for the purpose of docking flatted pellets of dough for crackers as they are progressively brought to and under the docker from the flatting apparatus, without materially disturbing the order of their arrangement on the apron.

194. Dovetailing Machine; W. A. McDonald, Mott Haven, New York.

Claim—The cutter head formed of a screw thread on a cylinder, the screw thread being provided with cutters, and arranged as described.

195. Printing Process; Gordou McKay, Boston, Massachusetts.

Claim—The combination of an impression cylinder and nippers. operating in conjunction with a blast pipe or mechanical means for producing an inequality of atmospheric pressure on the sheet when released by the nippers, and as said sheet is forced onwards by or with the impression cylinder in its rotary movement.

196. Repeating Fire Arm; Henry H. McKinney and Frederic Goth, Biddeford, Maine.

Claim—The combination of two strikers, one trigger, and a mechanism which will not only enable each striker to be set to and maintained at full cock, but by retraction of the trigger. will cause both strikers when at full cock, to be discharged or set free consecutively, so as to be forced against their respective nipples or the percussion caps, or the priming thereon, or the equivalents of such, and cause explosion of the priming of the charges in the order. Also, the specified application of the lock case with respect to the barrel, in combination with the construction and arrangement of the trigger-rod or slider in separate parts, and in such manner as to be capable of being locked together. and of being unlocked or disconnected under circumstances, as specified. Also, the application and arrangement of the two main springs of each striker in the lock case, as explained. Also, the combination of the trigger slide and the lever sears, arranged and operating with respect to the two strikers, as specified.

197. Cruets or Bottles for Castors; J. O. Mead, Philadelphia, Pennsylvania.

Claim—Constructing the cruets or bottles of cruet-stands, so that they may be adapted to each other and to the stand, as set forth.

198. Preventing Friction on Axles; T. S. Minniss and T. S. Minniss, Meadville, Pennsylvania.

Claim—The employment of sectors to avoid friction on rolling or sliding surfaces. Also, the combination of the shaft sectors and their adjusters, arranged as described.

199. Wheels for Railroad Carriages; A. R. Morrill, Northfield, Vermont.

Claim—A wheel for railroad purposes, having cast iron hub and rim, and a body of wood formed of double plates, and secured to the hub and rim by bolts, as set forth.

200. Retorts for Distilling Oils from Coal; John Nicholson, Allegheny, Pennsylvania.

Claim—1st, Furnishing retorts used for extracting the oleaginous matter from coal and other substances with agitators, or a shaft or shafts, armed with agitators, as described. 2d, In so arranging the supply and discharge openings and the exit pipes in connexion with the trunnions, that when one portion of the retort is weakened by the action of the fire, another part may be exposed to it, as described.

201. Machine for Making Bullets, &c.; Edward Nugent, Brooklyn, New York.

Claim—1st, The revolving self-cutting mould working in contact with the mouth of the lead kettle, through which the cavities are supplied with metal, in the manner set forth. 2d, The end motion of the two series of mould rings, and the opening and closing of the several rings in one series, while the cavities in the other series are being filled. 3d. The tumbling bars, or their equivalents, operating as described, by which a concussion is produced when the mould rings are opened, and allowance is made for any obstruction between the rings when closed.

202. Carpet-sweeper; N. B. Pratt, Deep River, Connecticut.

Claim—The arrangement of the rotating brush on adjustable swinging lever bearings, in combination with an elastic driving bolt, as set forth.

203. Vulcanizing Caoutchouc; C. S. Putnam, City of New York.

Claim—The combination of the boiler, the vulcanizing chest, and the condensing chamber, constituting a portable automatic apparatus.

204. Harvesters; B. F. Ray, Baltimore, Maryland.

Claim—The conical roller, in combination with the cam groove for actuating the means that operate the cutter bar.

205. Windlass; Jesse Reed, Marshfield, Massachusetts.

Claim—The combination of the windlass drums, pawls, with the wheel, and knee or sampson post, whereby the central wheel is supported on both sides, and the windlass rendered more simple and sure in its action.

206. Rocket Match-box; A. Roesler and Charles Frey, Warsaw, Illinois.

Claim—1st, The cylinders provided with strips and spring. 2d, The tool with spring, the whole being arranged as described.

207. Locks; A. A. Richards, Urbana, Ohio.

Claim—The arrangement of the wheels with their rings, and the spring and slides, for producing friction between them, and the arrangements of the bolts and its stems, and the use of the hands and dial, by which the principle of the above friction wheels and rings is applied to this lock. Also, the arrangement of the eccentric, brake, brake lever, check-bolt, and catch, by which the pressure of the stems on the rings simultaneously with the revolution of the hands and rings is prevented, as described. Further, the manner or arrangement above described, of revolving the dial by removing the screws, L L, as detailed.

208. Steam Engine; Gelston Sanford, Poughkeepsie, New York.

Claim—The inside head, in combination with the cross-head and elongated cylinder, constructed in the manner specified.

209. Mode of Sealing Letters, &c.; Joseph Saxton, Washington City, D. C.

Claim—The process of sealing, by means of fused metals or alloy, whereby the impression is made and the seal secured simultaneously.

210. Machine for Punching Railway Bars; George Shone, St. Louis, Missouri.

Claim—The arrangement and combination of the recessed gate, triple cam shaft, clamping screws, and adjustable buttons, as described.

[A sliding gate is fitted in a suitable framing, and provided with punches operated by means of cams and yokes; the punches work over a steel bolster, and the gate is recessed to receive the rail. By this arrangement rails can be punched at both sides simultaneously and very expeditiously.]

211. Converting Reciprocating into Rotary Motion; E. A. Smead, Tioga, Pennsylvania.

Claim—The fly-wheel with the adjustable wrist-pin attached, in connexion with the slotted bar or rod, B, and rod, C, the whole being arranged as set forth.

[In this invention, there is an adjustable wrist-pin attached to a fly-wheel, and fitted within a slotted vibrating arm which has a rod pivoted to it at right angles; these parts are so arranged that rotary can be converted into reciprocating motion with the least possible absorption of power by friction.

212. Method of Burning the Threads on Wooden Screws; T. Briggs Smith, City of New York; patented in England, January 1, 1859.

Claim—The application of a screw made on a bung, and another screw made in the stave corresponding with that upon the bung, both being formed by burning; this bung is to be used for all casks or vessels made of wood for liquids. Also, forming a screw by burning on a bung or stopple, to be used in any vessel made of any material, whether wood, metal, glass, or other material.

213. Fly-trap; S. W. Smith, Brooklyn, New York, and Hubbard Bigelow, City of New York.

Claim—1st, The combination of the endless web or apron with the plate or scraper, and the rollers, as described. 2d, The combination of the endless web with the roller and the pan, in the manner described.

214. Sewing Machines; Watson Snyder, Newark, New Jersey.

Claim—The combination of the fixed lipper guide for the under edge of the binding, the fixed but adjustable guide for the edge of the folder of the binding, and the elastic plate operated upon by the pressure pad or foot, the whole applied as set forth.

215. Defecating and Clarifying Saccharine Juices; John Spangenberg, City of New York.

Claim—The application of hydrated oxide of tin, prepared with sulphurous acid, for the purpose of

decolorizing or bleaching and defecating syrups, saccharine solutions, and liquids from sugar cane, and other saccharine and vegetable juices, whether the same be used alone or in combination with aluminum.

216. CHURN; Oren Stoddard, Busti, New York.

Claim—The combination of the crutch with the interior of the churn-box, so that the lower end of the said crutch shall act as, and constitute the dasher.

217. MOP-HEAD; Luke Taylor, North Springfield, Vermont.

Claim—A mop-head, having a loose collar provided with a screw thread.

218. ICE TONGS; John Tyler, Providence, Rhode Island.

Claim—The combination of a pick and cutter, or either of them, with a pair of ice tongs, by forming or attaching the same upon or to the back of either leg of the tongs.

219. RAILROAD SIGNAL LANTERNS; J. L. Wager, Deposit, New York.

Claim—The lantern case provided with the colorless glass plates, and loosely attached or suspended to the rod or shaft, which is connected with the switch bar or lever; the case being provided with the oscillating or partially rotating frame, containing colored glass plates, and connected with the rod or shatt, by means of the arm, arranged as set forth.

220. CLOTHES FRAME; Lawrence B. Waterman, Chicago, Illinois.

Claim—The combination of the stationary top support with the movable parts, when operated through the segmental racks, and arranged for the purpose of forming a tipping clothes-dryer frame.

221. METHOD OF LOCKING AND SUPPORTING THE PANELS OF FIELD FENCES; Elisha West, Ogden, New York.

Claim—The combination of the panels and the triangular brace or jack, when so arranged in connexion with the recesses of the panels, that by drawing the adjacent panels in opposite directions till the jack shall enter said recesses, the sections of the fence shall be securely locked together.

222. COATING METALS WITH TIN; Carl Winzen, Albany, New York.

Claim—Subject to the explanations and disclaimer, the solution composed of the ingredients in substantially the same proportions applied to accomplish the process of tanning, and used substantially in the manner described.

223. SECURING GARMENTS TO HOOKS; Gilman Woodward and Franklin S. Hathaway, Keene, N. H.

Claim—1st, Securing the hook to the vertical sliding plate, in the manner described. 2d, The manner of operating the arm, in combination with the movement of the hook and sliding plate. 3d, Arming the hook and the arm at their points of contact with movable spurs, in a manner described. 4th, The tumbler, when operated as described, or otherwise to produce the same effect.

224. ELASTIC TOYS; Lucius P. Porter, Assignor to the New York Rubber Co., City of New York.

Claim—The combination of a reed, or other speaking device, with a hollow elastic toy made of caoutchouc or gutta-percha, or their compounds for acting together, the former by the latter. Further, the manner described of securing the reed frame to the toy by grooving the frame on its edges or periphery, and inserting it in a hole in the toy, so as to be clasped in the groove by the edges of the elastic material in which the receiving aperture is made.

225. CORN AND COB MILL; John De Frain, Assignor to Wm. Callahan and Wm. Grant, Philadelphia, Penna.

Claim—1st, Making the hopper of the crusher adjustable on the shell of the same, so as to present to the ear of corn either the corner edge of the hopper or the inner edge of the shell, as occasion may require. 2d, The carrier, the inverted cup, and its adjusting bolt and nut, and arch-piece, in combination with the hopper and spindle, arranged and operating together in the manner described. 3d, The combined arrangement of the scrapers on the bottom of the rotating disk, the annular groove in the diaphragm, and the outlet and tubes, operating together in the manner described. 4th, The combined arrangement consisting of the outlets and the opening through the diaphragm, operating together with the rotary disk, in the manner specified.

226. WASHING MACHINE; Thomas A. Dougdale, Richmond, Assignor to Wm. M. Reed, Newcastle, Indiana.

Claim—Combining and arranging the inclined planes, the plates, and pins, with the double-inverted inclined planes, rollers, and wash-boards, arranged as described.

227. PAILS; Josiah J. Dutcher, Brooklyn, New York, Assignor to Noah Mosher, Norwalk, Connecticut.

Claim—The pail, constructed of the body, A, and jacket, B, of the materials specified, to form a new and useful article of manufacture.

228. SHEET METAL ROOF; Ezra Pollard, Albany, New York, Assignor to self and Joshua Gray, Westfield, Massachusetts.

Claim—1st, Securing the edges of sheet metal coverings of roofs, and other portions of buildings, by means of strips of india rubber, united to the said edges by lap-joints, and nailed to the building. 2d, The interlocking metal strips, formed and applied as set forth.

229. CONVERTING RECTILINEAR INTO ROTARY MOTION; George W. Richardson and Robert Glover, Grayville, Illinois, Assignors to selves and John J. Tanquerry, White County, Indiana.

Claim—The arrangement of the rocking racks, in combination with the segment wheel, as described.

230. ROCKING HORSE; Arad Woodworth, 3d, Boston, and Daniel Woodworth, Warren, and M. T. Hitchcock, Springfield, Massachusetts, Assignors to Arad Woodworth, 3d, and Daniel Woodworth, aforesaid.

Claim—A rocking horse, consisting of the head and neck of a horse, made as in the ordinary rocking horse, combined with a hollow box or cradle, so that the child can be placed therein, and which rocks longitudinally, thereby uniting the advantages of a rocking horse and cradle, and preventing the liability of accidents to the child by falling.

MECHANICS, PHYSICS, AND CHEMISTRY.

*On the Manufacture of the Uchatius Cast Steel.**

[Paper read at the Institution of Mechanical Engineers.]

The manufacture of cast steel, of which this paper treats, although not directly in the department of mechanical engineering, is so much connected with it, that a few words on that subject may be interesting to the members of the institution. The quality of the materials used for all parts of machinery and for the tools employed in their construction is of the greatest importance. These materials should possess the greatest strength and tenacity, and at the same time a durable and uniform wearing surface. Now cast steel perhaps beyond all other available metals possesses these qualities, and it is only its great cost that has hitherto prevented its more general application. It has a bearing strength of nearly three times that of the best forged iron, and having a perfectly uniform texture it wears equally; it must therefore be acknowledged that cast steel is the best material that can be used where lightness and strength are required, and for all parts of machinery that are subject to much wear and tear. Its great cost being the difficulty in the way of its extended application, the great object in view for some years past has been to find out some process of making cast steel of a good quality, and at a price that would allow of its free employment. Amongst a great number of metallurgists who have within a very recent period directed their attention to this subject, may be mentioned Bessemer, Chenot, Uchatius, and others. It is intended in this paper to enter only into the details of the Uchatius process of making cast steel, as compared with the ordinary processes at present in extensive use, which are two,—the English or converting process, and the German or puddling process.

To compare these processes with the Uchatius process about to be described, it must first be considered what steel really is, and in what manner it may be produced. This point may be illustrated by the following series, comprising the various degrees of wrought iron, steel, and cast iron, arranged according to the amount of carbon in each, beginning with the softest wrought iron, that is, with the iron containing no carbon, or the least amount of carbon :—

Soft wrought iron,	containing	0·0	per cent. of carbon.
Hard "	"	0·4	"
Soft steel,	"	0·5	"
Hard "	"	2·4	"
Cast iron,	"	2·5	"
Hard cast iron,	"	5·0	"

In this series, beginning with the softest wrought iron containing little or no carbon, the proportion of carbon increases until there is ½ per cent., which then forms soft steel; a further increase of carbon up to 2½ per cent. forms cast iron ; and the proportion of carbon increasing to 5 per cent. gives the hardest cast iron. Hence it appears that

* From the Lond. Civ. Eng. and Arch. Journal, Jan., 1859.

the operation of steel making may be effected in two methods,—either by adding a certain amount of carbon to pure wrought iron; or conversely by taking away a certain amount of carbon from cast iron, removing at the same time the impurities of the cast iron.

The English or converting process is carried on according to the first of these methods, by adding a certain amount of carbon to wrought iron. The cast iron is first made into wrought iron, which is then converted into steel, forming blister steel; this is broken into small pieces and melted in crucibles, which renders it homogeneous, and is then poured while fluid into ingot moulds, after which it is known as cast steel. The chemical changes which the cast iron has undergone in this process are—firstly, when it was manufactured into wrought-iron all or nearly all the carbon was abstracted from it; and secondly, by the converting process a certain amount of carbon was restored to it; and finally, the steel thus produced was made homogeneous by melting and casting. It is evident that this is a very circuitous way of manufacturing cast steel, and it has the following disadvantages: the great loss of weight in manufacturing the cast iron into wrought, the difficulty in converting the wrought iron so as to carbonize it equally in all parts; the great length of time that this process requires for the production of cast steel, and the great cost of manufacture.

The German or puddling process is effected by the converse method, by taking away a certain amount of carbon from cast iron. The pig iron is puddled in the same way as in making wrought iron, except that the process is stopped when a certain amount of carbon has been taken away, a point which it is difficult to judge of. This partially puddled iron, so-called puddled steel, is then made homogeneous by melting it in crucibles in the ordinary way. The chemical change which the cast iron has undergone by this process is the abstraction of a portion of the carbon in the puddling furnace; and the puddled steel has then been rendered homogeneous by melting and casting. The disadvantages of this method are: the waste of iron by the puddling process; the uncertainty of getting equally discarbonized iron, owing to the difficulty of measuring the quantity of oxygen acting on the puddled metal; and also the cost of manufacture.

The Uchatius process is based upon the same principle as that last described, consisting in taking away as much carbon only as is required to produce steel, and removing at the same time the impurities of the cast iron. The first and most important of these objects is effected by bringing a certain measured quantity of oxygen, in the shape of oxides of iron, in contact with the cast iron, so that while the iron is hot the oxygen combines with the carbon and passes off in the form of carbonic acid gas. The purification of the cast iron from silica, sulphur, magnesia, &c., is effected by bringing the iron when it is in a melted state into contact with the alkaline earths, so that the impurities combine with them and remain floating on the top of the melted metal.

In order to effect these two operations at the same time the pig iron is first melted in a furnace or ordinary foundry cupola, and then run into a cold water tank, where it is reduced into small granules. The

mode in which the granulation is performed is stated to be as follows: the cold water tank has a horizontal wheel placed in it at one end, provided with wooden floats dipping below the surface of the water, and driven at a considerable speed; the melted metal running into the tank from the furnace falls on the wheel, which scatters it in a finely divided state towards the deep end of the tank, and it falls to the bottom in the form of small granules. This granulated cast iron is mixed with pulverized oxide of iron and some alkaline earths, and the whole put into the ordinary steel melting crucibles and placed in the furnaces and brought into a fluid state. The degree of hardness of the steel is thus capable of being regulated by the size of the granules and by the quantity of oxides used.

The chemical change which takes place in the crucible is as follows: Each granule being surrounded by the pulverized oxides, &c., the decarbonization takes place first on the outside of each granule, and so progresses towards the centre as the heat increases, the oxygen in the ores combining with the carbon in the granules and passing off as carbonic acid gas; if therefore during the process the granules could be examined, it would be found that the outside of each is entirely deprived of its carbon, the next portion partially decarbonized, and the centre not decarbonized at all; so that each granule would be composed of pure wrought iron, steel, and cast iron. By increasing the heat, the cast iron centre portion of the granule first becomes fluid, and the granule bursts and falls by its own weight to the bottom of the crucible. At the same time the earths mixed with the ores melt and rise to the top, forming a layer of scoria or dross floating on the surface of the melted iron. Each granule of melted metal has therefore in falling to pass through the rising scoria; and it is in the passing through that the combination of the impurities of the metal with the alkaline earths takes place, so that the decarbonized iron on reaching the bottom of the crucible is cleansed from all impurities. The heat continuing to increase melts the outside portions of the granules, and the whole is reduced to one homogeneous fluid mass in the crucible, which is then ready for being poured into the ingot mould. The iron contained in the oxides mixes at the same time with the fluid mass, and yields about 6 per cent. more of cast steel than the weight of granules put into the crucible.

The oxides employed in this process are iron ores of the finest quality, such as spathose and hematite, which are previously calcined and pulverized. The proportion of the oxide to the granulated iron is according to the hardness of steel required, say from 20 to 30 per cent.; the greater the quantity of the oxide employed, the greater the decarbonization, and consequently the softer will be the steel produced.

The process is attended with the following advantages:—A rapid manufacture of cast steel, the pig iron being turned into cast steel in the space of a few hours; certainty in producing a uniform quality of steel, that is, steel containing a determinate proportion of carbon, which is accurately determined beforehand by the weight of oxide mixed with the granulated iron; and less cost than the ordinary me-

thods of making cast steel, since the processes are fewer and the materials used are simply pig iron and iron ores.

Some experiments in making cast steel by the Uchatius process have been made by the writer at the Newburn Steel Works, near Newcastle-on-Tyne, from which it appears there is little doubt that a very fine quality of cast steel can be produced at a cost little more than one-half of that entailed by the common processes.

A specimen of steel bar was shown made by the process described in the paper, which had been tested and broke with a load of 30 cwt. at the centre, the bar being 1 inch square and 3 feet in length between the bearings; the deflection was $3\frac{3}{8}$ inches at the time of breaking. A specimen was also exhibited showing the welding of the two pieces of the steel, and specimens of the granulated iron and the pulverized ore used in the manufacture, and of the bars and plates produced, with some volute springs made from the steel; also a piece of the steel twisted cold to show its toughness.

Mr. T. Spencer said that he had not tested the tensile strength of the steel at present, but found it stood well in the volute springs that had been made of it, which had proved quite satisfactory in working. Only some small plates had been rolled from the steel at present as a trial, but these had proved quite satisfactory; and he did not anticipate any difficulty in making any size required. It would be observed in the specimen exhibited, that the plate was quite sound on the edges, although it had not been rolled edgeways, but simply rolled down lengthways. No wire had yet been made from it; the bars and plates made had been hammered and rolled down from the ingots of cast steel. The total cost of the finished bars was about one-half of that by the ordinary process; but where the makers hammered and rolled their own steel, and the cost of the ingot only had to be compared, the proportion would be considerably less.

Mr. W. Fairbairn thought this process was a very important step in steel manufacture, and would prove of great advantage in the construction of machinery, if a sound uniform steel could be obtained at a moderate price. The bar of the new cast steel that was exhibited certainly showed great strength, having sustained nearly three times as great a weight as iron; and he thought in process of time they might reasonably expect to obtain plates cast and rolled of that manufacture at least double the strength of the present wrought iron boiler plates for the same thickness, and not much more expensive for the same strength; and it had now become a very important desideratum to get plates for boilers only half the thickness at present used, as the thinner plates were so much less liable to injury from overheating and unsoundness in manufacture.

Mr. T. S. Prideaux thought the dropping of the melted iron into water in the process of ganulating it would have a beneficial effect in assisting to free the metal from sulphur, by the metal coming in contact with water in a red hot state; the plan had been tried in Austria, he believed, with success. It was not at all easy to separate sul-

phur from iron by simple exposure to oxygen in atmospheric air; and he thought the plunging of the highly-heated granules in water would be the means of removing the sulphur to a considerable extent from the iron.

Mr. W. Smith thought the process that had been tried in Austria was that of Capt. Uchatius now described; the plan of granulation seemed a very ingenious and important step towards obtaining steel by the direct process of decarbonizing, and offered the best chance of carrying that process to a successful and economical result. Great advances were being made at the present time in steel manufacture, and they were doubtless greatly indebted for these advances to the investigation of the subject that had been excited by the publication of Mr. Bessemer's plans, although he had not succeeded in all that he had attempted himself; and they were also much indebted to Mr. Binks for having called more minute attention to the chemical principles involved in the manufacture of steel. The new process described in the paper appeared to have effected a great success in obtaining cast steel by the direct process; and if the uniformity of quality could be maintained, the economy of manufacture would allow of the use of cast steel being extended to many important new applications, such as boiler plates, and steel wire for the manufacture of telegraph cables.

Mr. A. Lenz explained respecting the process, in the absence of Capt. Uchatius, that the only object in dropping the melted iron into water was to effect its granulation, and not for the purpose of depriving it of sulphur. The process of this manufacture of steel was to decarbonize the cast iron by the action of oxides under a high temperature, the great object being to expose the largest possible surface of the iron to this action, and by granulation this object was obtained to a remarkable extent. As to the actual composition of the steel, Capt. Uchatius had come to the conclusion, from the results of his observations, that the best steel required some small portion of what are considered impurities, such as sulphur, silica, &c.; and that chemically pure steel was not the result to be aimed at, and he had found that even with $\frac{1}{4}$ per cent. of sulphur the steel was of good quality. The great desideratum was to make steel at a very cheap price; and he had hopes it might even be practicable to apply it ultimately to the manufacture of railway bars.

Mr. J. Anderson observed that the first steps had certainly been accomplished towards obtaining a better material at a reduced cost, and this was a very important object to be aimed at. Mr. Binks had been the first to draw attention to the fact of steel containing nitrogen, which from his researches appeared to be an ingredient of great importance in the composition of the different qualities of steel, and he was not aware whether any further information had been obtained upon this point.

Mr. E. A. Cowper remarked that, in the list of compounds of carbon and iron given in the paper, the hard cast iron was put down as having the largest proportion of carbon; but he supposed it was not meant that the hardest cast iron was that containing the most carbon,

as the extreme of soft grey iron was kishy from an excess of carbon. He asked whether the Uchatius process removed the phosphorus from the iron; and what were the results of Chenot's process, by which a spongy mass of iron was produced, which was then compressed and dipped into oil, converted and worked into bars.

Mr. A. Lenz said that only the good qualities of iron were attempted to be used for steel-making by the Uchatius process, and the Indian and Swedish iron was principally used, containing very little trace of phosphorus, as it was doubtful whether any phosphorus could be removed in the process.

In Chenot's process the principle was to employ pure magnetic iron ore in powder, which was found in a few situations in the Pyrenees in a natural state of powder, and was separated by a machine from the earths mixed with it. This powder was put into a furnace like a cupola, within a tube in the centre protecting the ore from the fuel, and exposed to a great heat; the powder then became in a spongy state, by reduction to nearly pure iron, but was not able to melt. It was then compressed cold with great force under a hydraulic press to solidify the mass, and was finally carbonized by covering the mixtures of oils and other carbonaceous substances, and melted in a close crucible. He doubted the process being adapted for the actual manufacture of steel on any large scale, and thought it more suitable for the laboratory than the shop; various articles have been made of the steel for trial, which he believed were of a good quality, although he thought there was not any regular manufacture carried on.

Mr. W. Fairbairn had seen the process in operation two years since in Paris, and the steel that was manufactured by that means was of good quality; but the process was carried out only on a small scale, and seemed scarcely suitable for any wholesale manufacture.

Mr. T. Spencer observed that a magnetic machine was employed to separate the iron from the earthy matter, when in the state of powder as found naturally. The pig iron was broken into 6 or 8 inch pieces, and was at first put into the cupola for melting in the ordinary way; but they had now constructed a furnace for the purpose, as the ordinary cupola rather increased the proportion of sulphur in the metal by absorbing some from the fuel; the new furnace was a kind of reverberatory furnace, melting the iron in a chamber separate from the fire. The fluid metal was then run into the granulating tank; and the granules of iron were collected at the bottom of the tank by drawing off the water.

De-odorizing Alcohol.

In trying to prepare a transparent soap, M. Kletzinsky has made a curious observation which may be of value in the arts; he found that empyreumatic alcohols distilled over properly selected soaps lost their bad odor and their bad taste. A series of experiments resulting from this first observation lead to the following results:—

1. Spirits of wine, brandy, or alcohol distilled over soap lose their

empyreumatic odors and tastes entirely. About 212° the soap retains neither alcohol nor wood-spirit.

2. The empyreumatic oil which remains in combination with the soap which forms the residuum of the distillation, is carried off at a higher temperature by the vapor of water which is formed during a second distillation, the product of which is a soap free from empyreuma and fit to be used again for similar purposes.

3. The concentration of the alcohol increases in this operation more than when soap is not employed, because this compound retains the water, and the alcoholic vapors which pass over are richer.

4. 33 lbs. of soap is enough for 100 gallons of empyreumatic brandy, and direct experiments have shown that under the most favorable circumstances, the soap can retain 20 per cent. of empyreumatic oil.

5. The soap employed should contain no potassa; it must be a hard or soda-soap, and ought to be completely free from any excess of fat-acids or fluids, otherwise it may render the product rancid and impure. Common soap made with oleine and soda by the manufacturers of stearine-candles has satisfied all the conditions in practice. If this soap is employed, it will be better to add a little soda during the first distillation.

The hard soda-soaps, as exempt as possible from fluid fat-acids, remove completely the empyreumatic odor, and act, for equal weights, much better than any of the other modes heretofore proposed, which disguise rather than correct the fault.

For the Journal of the Franklin Institute.

METALLURGICAL NOTES, NUMBER I.

Manufacture of the Oxide of Zinc near Lancaster, Pennsylvania.

By W. J. Taylor.

The occurrence of sulphate of zinc in the oxide of zinc of commerce, such as is used as a paint, has not, to my knowledge, ever been noticed. It may not be uninteresting to metallurgists and chemists to mention such occurrence; the quantity of sulphuric acid found by analysis in the oxide of zinc, the process used in the manufacture, and the ore from which it was obtained; also, to mention some of the objectionable properties which were attributed to the presence of the sulphuric acid.

The article in question was made at *temporary* works for the manufacture of zinc oxide near Lancaster, Pennsylvania; temporary works as being evidently designed by the originators of the company (which was organized for the purpose of mining the ore and manufacturing the oxide,) to last only until a favorable opportunity would offer to enable them to sell their stock.

It will first be necessary to describe the ore of the mine, and to do this properly it will be advisable to mention a little about the mine and its geological position. The ore occurs in a blue magnesian lime-

stone of the lower silurian system; there appeared to be two layers of the zinc ores, which were divided by a layer of the dolomite; but this was most probably only an appearance, as the layers evidently united at a comparatively slight depth. The deposit is situated in a valley and dipped north at an angle of thirty-two degrees; between the dolomite and the lower layer of zinc ore, was a seam of galena from two to three inches in thickness, which frequently diminished to a mere thread. Carefully selected specimens of this galena contained about an ounce of silver to the ton (2000 pounds). On this slight appearance, the mine was formerly worked as a lead mine. The mass of the zinc ore of both layers was blende, which was mixed intimately through the dolomite in a way peculiar to this locality. The zinc blende had decomposed near the surface and a carbonate of zinc resulted, with very small portions of electric calamine (silicate of zinc). The mine being in a valley, water was reached at a short distance, and below this, the ore was entirely the sulphuret of zinc.

It was advised before erecting the works to explore the locality more fully, in order to find whether more of the carbonate existed, but such advice was disregarded, and metallurgical works were erected.

The carbonate which had previously been extracted in the explorations for the lead, was first used in the furnaces, and a superior quality of oxide of zinc was made from it; but this ore was soon exhausted, (there never was more than about two hundred tons of the carbonate of zinc taken from the mine,) and as a last resort, the zinc blende was used. It was surmised that from the peculiar mechanical mixture of the blende with the magnesian limestone, that at a high heat a double decomposition might result; oxide of zinc being formed, and the sulphurous vapors uniting with the lime and magnesia form sulphurets of calcium and magnesium, which would remain with the slag.

This very pretty theory unfortunately was not entirely verified by actual experiments. Large quantities of sulphurous acid gas was evolved, and in addition, sulphuric acid was formed, which united with the oxide of zinc. The sulphate of zinc resulting, though in small quantities in the oxide, prevented this latter from being ground with oil, advantageously, so that the manufactured article, which, from its appearance and the known quality of the oxide manufactured from the pure carbonate was readily sold by sample, after trial was returned as useless for the purposes of grinding in oil as a pigment, the complaint principally was that it was too great an absorbent.

No. 1 contained—

Sulphuret of zinc,	45·34	per cent.
Carbonate of lime,	26·80	"
Carbonate of magnesia,	14·88	"
Carbonate of iron,	5·04	"
Silica,	5·43	"
Water and loss,	2·51	"
	100·00	

[45·34 per cent. of sulphuret of zinc yields 36·73 per cent. of oxide of zinc.]

This ore, as will be at once seen from the above analysis, was zinc blende mechanically mixed with magnesian limestone. At the closing operations at this mine and at the lowest of the workings, an average sample gave on analysis not more than 8 per cent. of the oxide of zinc.

No. 2 contained—

Carbonate of zinc,	78·70	per cent.
Carbonate of lime,	12·64	"
Carbonate of magnesia,	2·62	"
Sesqui-oxide of iron,	2·32	"
Silica,	2·36	"
Water and loss,	1·36	"
	100·00	

[78·70 per cent. of carbonate of zinc yields 51·00 per cent. of oxide of zinc.]

This ore, as has been mentioned, was the result of the decomposition of the blende, above water level and to the depth at which atmospheric agencies had penetrated.

No. 3.—Is the result of analysis of a sample of the oxide of zinc manufactured from zinc blende composition shown by No. 1.

Oxide of zinc,	78·07	per cent.
Sulphuric acid,	4·60	"
Water,	15·00	"
Sulphate of lead and quartz,	2·77	"
	100·44	

As there has been but little published regarding the processes used in the United States for the manufacture of the oxide of zinc, a little sketch may not here be uninteresting.

The process used at the Lancaster works was generally the same as that used at the Lehigh works; indeed, there is but little difference even in the works at Bergen Hill and at Newark, New Jersey; with the exception that at the two latter named places, a variety of reverberatory furnace was used in place of the superior one patented by Samuel Wetherill, Esq., of Bethlehem, Pennsylvania; though I believe Mr. Wetherill's furnace is now used at Bergen Hill works.

The Wetherill furnace consists of a semi-circular arch of fire-brick turned over a hearth of perforated grate bars, with a tight ash-pit beneath, into which a steady blast is blown, which diffuses itself beneath the entire fire surface through the perforations in the bars, which are filled with holes not greater than a quarter of an inch in diameter.

These grate bars are about two feet long by about five or six inches in width; two lengths being the width of one furnace. The perforations are conical, being the smallest at the top. The front of the furnace is closed excepting a door-way about eighteen inches square. The oxide of zinc volatilized, passes through openings in the top of the furnace arch, which connect by short iron vertical pipes with a large horizontal conducting pipe, which serve for a "bank" of furnaces; for the furnaces are built in banks of a dozen or more. A strong draft caused by a large fan blower draws the oxide as it is volatilized from

the furnaces through this same blower, which forces it into brick buildings or houses, where it passes in at the bottom and out at the top, and by this passage deposits the heavier particles of ashes or little impurities which the draft carried from the furnaces; the vapor passes out the top of this brick building into another built a short distance from it filled with immense muslin sacks, through which the vapor of zinc is filtered, the cotton fabric prevents the passage of the oxide of zinc, but does not hinder in the least degree the escape of the coal gas. These cotton bags require to be shaken constantly during the day, the pores of the muslin becoming so coated with the oxide of zinc as to prevent the escape of the coal gas. They are generally arranged with vertical appendages, into which the oxide falls, and is removed from time to time. These muslin filters were invented by Mr. Richard Jones, of New Jersey, several years since.

The furnaces are charged with the pulverized ore, mixed with about 33 per cent. of fine coal, a fire being started on the grate bars before the charge is added.

Artificial India Rubber.

We take from the Proceedings of the Academy of Sciences of Paris, the two following communications, in the hope that they may prove useful in our arts:—

On the Action of Chloride of Sulphur upon Oils. By M. Z. Roussin.

If a vegetable oil be mixed with about $\frac{1}{30}$ of its bulk of chloride of sulphur, this latter substance will be entirely dissolved; in a little while the mixture heats and assumes a viscous consistence, so that frequently the vessel may be inverted without spilling the contents.

If the chloride of sulphur is in the proportion of $\frac{1}{10}$, the preceding phenomena acquire greater intensity. The mixture soon attains a temperature of 120° or 140° Fah., some bubbles of hydrochloric acid are disengaged, and the whole mass solidifies instantaneously without losing its transparency, and acquires a consistence like caoutchouc. This product possesses some elasticity and shrinks slightly after consolidation. Macerated in distilled water it loses its transparency and becomes opaque white. In a few days it is transformed into a white, slightly friable, elastic mass, having no similarity to the original substance, and resembling rather an organic substance.

If we take a mixture of one part of chloride of sulphur, and nine of oil, and heat the mixture, we shall find that at about 140° a pretty strong re-action shows itself. Hydrochloric acid is disengaged, and the mass is transformed into an elastic cavernous substance like sponge, very closely resembling certain cryptogamic vegetations. Macerated in water, it becomes whiter without changing its form.

All these products resist the action of boiling alkalies, whether dilute or concentrated. Ammonia and the concentrated acids have no action on them. Neither water, alcohol, ether, sulphuret of carbon, or the oils appear to alter or dissolve them.

At the temperature of 300° Fah. they remain solid and unaltered. A few degrees above this point they begin to melt into a brown liquid and emit whitish acid vapors. We have not had time to determine the composition of these substances. After long boiling in alkaline solutions, reiterated washings with dilute acid and boiling water, they still contain sulphur and chlorine in considerable quantities. In this state, the slightest shaking communicates to them a peculiar vermicular motion, which continues for some time.

Action of Chloride of Sulphur on Oils or Vulcanization of Oils.
By M. Perra.

The chloride of sulphur combines at ordinary temperatures with flaxseed oil as well as with other oils.

If we take 100 parts of flaxseed oil and about 25 parts of chloride of sulphur, we obtain a compound which has the maximum hardness.

100 parts of the oil and from 15 to 20 of the chloride give a flexible compound.

From 5 to 10 parts of the chloride will thicken 100 parts of the oil very strongly without hardening it. In this state it is soluble in all the solvents of common oils. This is not the case with the other combinations, which swell somewhat, and lose a little sulphur without dissolving in solvents.

If we dilute a given weight of flaxseed oil with 30 or 40 times its weight of sulphuret of carbon, and introduce one-fourth of the weight of the oil of chloride of sulphur, we have a product which will remain liquid for some days. If in this condition it be applied upon glass or wood, &c., the sulphuret of carbon evaporates and you have instantly a varnish.

The chloride of sulphur saturated with sulphur is preferable for these actions, to that which is not saturated.

In making these mixtures, proceed as follows :—Introduce the chloride of sulphur quickly into the oil, which must be stirred so as to mix them intimately. Gradually the mass heats, the combination takes place, the oil thickens, and forms a compound more or less soft according to the proportions of the chloride. But small quantities should be operated on at a time, and all elevation of temperature must be avoided, otherwise the chloride of sulphur will be volatilized, and will form bubbles in the mass, or carbonize and blacken the oil. As soon as these two substances are intimately mixed, pour the mixture on a plate of glass or other polished substance, smooth it, and in five or six minutes, according to the temperature of the air, you obtain the compound. With the point of a knife detach one of the corners of this pellicle, which may easily be raised without breaking. One coat may be laid over another, and they will unite in one, provided the upper one be put on after the temperature of the lower has been reduced ; moisture in the air must also be avoided, which decomposes the chloride and prevents the adherence.

By following this mode, I have succeeded in making little boxes, knife-handles, &c. By introducing wire gauze into the mixture, plates of considerable resistance may be procured. This is easily done by laying the wire gauze on the glass and proceeding as above.

All the products thus made, are completely transparent, if care be taken to keep the articles in a stove or other warm place to drive out the vapors of chloride of sulphur, and prevent the dampness from decomposing this compound. These hard compounds of oil are not attacked by any atmospheric influences; I have left them for several years exposed to the external air.

These compounds are not, like vulcanized india rubber, flexible when cold, but are brittle when handled carelessly, which is an inconvenience. A still greater one is the decided smell which they retain for a long time.

I have tried to make them as hard as hardened india rubber, but in vain. Almost all substances introduced into them are altered by the chloride, and add nothing to the hardness.

They can, however, easily be colored. It requires but a little color mixed with the oil before the introduction of the chloride. Some colors, however, are altered by it.

These compounds resist very well the mineral acids and alkalies when moderately dilute. These alkalies concentrated saponify them finally. A heat of 250° browns them, a higher temperature melts them with a blackish color. This vulcanized oil may be well used for moulds, as it takes impressions very sharply. When rubbed, it always keeps a smooth and polished surface. It has electric properties in a high degree, and might be used for plates for electric-machines.

I have not been able to apply this substance upon stuffs, in consequence of its acid reaction, which destroys them. I have plated wood with it, by first roughening the wood so as to cause it to adhere. It may be applied for floor-cloths, table-covers, imitation marbles, window panes, &c.

I will remark, in conclusion, that the bromide of sulphur has the same properties as the chloride, and it was, in fact, with the former that I made my first experiments at the College of France, in 1853.

For the Journal of the Franklin Institute.

Use of Carbon for Dusting Moulds for Casting Metals.

By W. J. Taylor.

In the February number of the *Journal of the Franklin Institute*, is a notice of a recent English patent for the dusting or coating the inside of sand moulds for iron castings, with pulverized carbon which is free from bituminous matter. This may possibly be new in old England, and doubtless is considered by the worthy officials of the circumlocution office as requiring special protection; the process is, however, quite an old one in the United States, and is here so universally known

that it will not be possible to find a furnace or foundry in the country where pulverized charcoal or anthracite is not used or has not been in use. I believe that in some foundries a chemical compound is now used, one of the principal components of which is probably carbon.

New Dividing Engine. By M. Froment.

M. Froment requested from the Academy of Sciences of Paris, an examination by a committee of his mode of dividing astronomical instruments. This mode is not of recent invention, but has been in daily use by M. Froment for a long time, and has been shown to many of the members of the Academy. Respect for the memory of the late M. Gambey, and a fear of injuring the interests of the heirs of this illustrious mechanic, have alone retarded the official presentation of this process of incomparable exactness. After, however, the presentation by M. Guillemot of means for the same end, M. Froment feels that he has the right to take public possession of his own discovery.

The processes employed for the division of circles and of straight lines are analogous; let us therefore suppose that we are describing one of the latter kind, the principal organ of which is a screw with a thread of 1 mm. (0·04 inch).

Upon the chariot which carries the tracer is placed a metallic rule, on which are traced two fine lines, the arbitrary distance of which apart (*d*) must remain the same during each experiment.

The chariot being brought to its starting point, a microscope upon the table of the machine is brought exactly over one of the marks, and the number of turns and fractions of a turn (*n*) of the screw noted, which are required to bring the second line under it; that is, to advance the chariot through the space *d*.

The microscope is then moved to correspond again with the front line; and the observation repeated again and again until the chariot has advanced the whole length of the screw; and thus the number of turns corresponding to an equal length at different parts of the screw is determined. These differences may be read either upon the head of the screw, or on a filar micrometer in the microscope, or by means of a comparing lever, &c.

By repeating these operations with properly chosen values of *d*, we get to know the condition of the screw at all its points.

Upon a band of metal a curve is then traced, whose abscissas represent the successive quantities by which the chariot must advance when dividing; and whose ordinates have lengths proportional to the variations of the screw thread determined as shown above; and as these variations are ordinarily small fractions of a millimetre, they are represented by ordinates some hundreds of times larger.

The band of metal is then cut out along the profile of the curve, and adjusted in a groove so as to move with the dividing chariot.

A little roller whose centre is restricted to move in the plane of the

curve, and perpendicularly to the abscissas, rests on the curve. As the curve advances it obliges this roller to rise or fall according to the ordinates which it meets, that is, proportionally to the errors to be corrected; but with a motion much greater than the errors, an important point in the method, since it permits us to neglect certain inaccuracies in the execution of the curve and of the pieces moved by it.

Then by reducing the motion of the roller by means of levers or their equivalents, we easily communicate to the tracer a motion equal and in a contrary direction to the errors of the screw at different points of its length, and consequently we divide by the machine as if the screw was perfectly uniform.

In place of communicating to the tracer the slight displacement which we have explained, we might apply it equally well to the screw itself, by acting on the piece against which the screw rests.

A third means of correction consists in communicating the motion of the roller to the system of stops generally employed to limit the angle through which the screw turns at each division traced by the machine; this angle being thus increased or diminished at each instant by quantities corresponding to the irregularities of the thread, it will result that the nut and the attached chariot will move regularly.

The same means are applied in a similar way to the machines for dividing circumferences, which generally consist of a circular platform whose circumference is toothed and moved by an endless screw.

To determine the errors, an arbitrary arc is taken, whose extremities are marked by fine lines, which are brought successively under the microscope which is displaced around the circumference, so as to engage the screw in different parts of the rack. The curve is traced by polar co-ordinates upon a disc which has the same angular motion as the principal platform, and the roller is moved by either of the methods mentioned above. These three methods employed for several years upon different machines, have given equally satisfactory results.

To complete the above explanation, I would add, that instead of seeking to determine at once in great detail, the errors of the machine, for the purpose of applying definitive corrections, it is better to begin by an approximate determination, which gives a provisional curve and produces a considerable amelioration in the machine. By a new study of it in this state, we are led to corrections of the second order, which may be followed by those of a third; but in almost every case, the second are sufficient to attain the limits of accuracy belonging to the kind of correction which we are considering.

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Remarks.—We understand that the machine used by Messrs. Darling & Schwartz, of Bangor, Maine, for dividing the rules to which first premiums have been awarded at two successive Exhibitions of the Franklin Institute, combines the same leading idea, as the very ingenious machine here described by M. Froment. *Ed. Jour. Fr. Inst.*

Copying Drawings by Galvanism.

Marshal Vaillant described to the Academy of Sciences of Paris a mode of copying drawings devised by M. Defrance, and perfected by Colonel Levret. The process is as follows:—

The drawing is made on transparent paper, and is laid, face downward, upon a board, and fixed by tacks. Coats of gelatine are then applied with a brush to the back of the drawing so as to obtain a sheet of gelatine from $\frac{1}{100}$ to $\frac{1}{50}$ inch thick. Upon this gelatine the drawing is traced with a simple point. A solution of gutta-percha in sulphuret of carbon is then applied with a pencil, and the coatings repeated until it has also assumed a thickness of about $\frac{1}{100}$ of an inch. This will require at least thirty coats. When the gutta-percha is sufficiently dry, a plate of copper is laid on it to give it stiffness. The whole is then turned up, and the original drawing exposed. This is easily removed, and then by delicate touches of a sponge dipped in water, the gelatine is separated from the gutta-percha, which is metalized by black lead. The plate is then electrotyped as usual.

The Marshal, (who is Minister of War,) declares that by applying this process to the six-sheet map of Kabylie, they have obtained an economy of seven-eighths of the time, and of six-sevenths of the expense.

Acad. of Sciences of Paris, Nov. 19, 1858.

FRANKLIN INSTITUTE.

Proceedings of the Stated Monthly Meeting, March 17, 1859.

John C. Cresson, President, in the chair.

John Agnew, Vice President, } Present.
I. B. Garrigues, Recording Secretary, }

The minutes of the last meeting were read and approved.

Donations to the Library were received from Prof. A. D. Bache, Washington, D. C.; the Board of Water Commissioners, Detroit, Michigan; Young Men's Mercantile Library Association, Cincinnati, Ohio; Prof. Joseph Lovering, Cambridge, Mass; Cornelius A. Walborn, Pennsylvania Legislature; and Dr. T. S. Kirkbride, Professors John F. Frazer, John C. Cresson, and B. Howard Rand, H. P. M. Birkinbine, Esq., John E. Addicks, Esq., and Philip Price, Esq., Philadelphia.

The Periodicals received in exchange for the Journal of the Institute, were laid on the table.

The Treasurer's statement for February, was read.

The Board of Managers and Standing Committees reported their minutes.

The Board of Managers reported that they had organized for the present year by electing Robert Cornelius, Chairman, and Messrs.

Isaac S. Williams and James H. Bryson, Curators, and appointed the following Standing Committees:

On Publications.	*On Instruction.*	*Managers Sinking Fund and Finance.*
John C. Cresson,	John F. Frazer,	Frederick Fraley,
B. H. Bartol,	Frederick Fraley,	Samuel V. Merrick,
J. V. Merrick,	Isaac B. Garrigues,	Evans Rogers,
Fairman Rogers,	Alan Wood,	John F. Frazer,
Washington Jones,	George Erety,	Joseph Harrison,
	Lawrence Johnson,	George Erety.

The stated meetings to be held on the second Wednesday evening of each month.

The Actuary reported that the following Standing Committees have organized by electing their chairman, and appointing their times of meeting:

Committees.	*Chairman.*	*Meetings.*
On the Library,	Henry K. Plumley,	1st Tuesday evening.
" Exhibitions,	John E. Addicks,	1st Thursday afternoon.
" Arts and Manufactures,	David M. Hogan,	1st Friday evening.
" Minerals,	John C. Trautwine,	2d Monday "
" Science and the Arts,	John C. Cresson,	2d Thursday "
" Meetings,	Washington Jones,	Monday previous to 3d Thursday.

Candidates for membership in the Institute (3) were proposed, and the candidate proposed at the last meeting (1) was duly elected.

Dr. Rand exhibited two stereoscopic photographs on glass of the surface of the moon, taken by Mr. L. M. Rutherford of New York; also, a number of single pictures on paper of the same; also, a series of large photographs of the experimental steamer built by Messrs. Winans of Baltimore.

Dr. Rand exhibited a new design for valve gear, by S. L. Wiegand. It has been submitted to the Committee on Science and Art for an examination and report, which when made may be found in the proceedings of that Committee.

Mr. D. R. Pratt exhibited and explained the model of an electro-magnetic burglar, fire, and house alarm, invented and patented by Mr. William Whiting of Roxbury, Mass. It consists of a series of electro-magnetic circuits leading from the various parts of the building to be protected, through an indicator to an alarm apparatus, which is put in operation by breaking the connexion of any of the circuits, which is done by opening the doors, windows, or other means of access to the places guarded. A very ingenious arrangement is also provided for indicating the presence of fire by a sensitive metallic coil, which, by its expansion, will break the circuit. The special circuit broken is shown by the indicator; which with the alarm apparatus can be put up in any convenient place for observation. Mr. Pratt stated that the apparatus had been in practical operation for several months and had proved satisfactory.

Mr. A. N. Macpherson exhibited the model of a paddle-wheel for steamboats, invented by Mr. William Golding of Philadelphia. The model illustrated two very ingenious plans for feathering the paddles;

one by ratchets operating on a cog-wheel attached to the shaft; the other by an eccentric also placed on the shaft.

W. Jones submitted the register for warming and ventilating apartments, invented by Joseph Leeds. It consists of the usual openwork plate with a flat valve swinging on pivots set in a horizontal line. When the lower edge of the valve is brought forward against the openwork plate, the communication between the heat flue and the apartment is closed, while that between the apartment and the ventilating flue is opened. When the position of the valve is reversed, the heat is admitted and the ventilator closed. Should the apartment have the proper temperature, the valve is placed vertically, when the heat passes directly up the ventilating flue back of the valve. The Committee on Science and Art have had this register under consideration, and their report will no doubt appear in the pages of the *Journal.*

Mr. Agnew laid upon the table some scale detached from a boiler by the use of a chemical compound for cleaning boilers, &c., by Chester, Clark & Co., Practical Engineers, Allentown, Lehigh County, Pennsylvania, which appears to be useful in removing that troublesome complaint arising from the use of limestone water.

Mr. H. Howson presented some specimens of burnt cast iron recovered by the use of graphite, as applied by Messrs. Morris & Quain. No. 1 was made from old retorts melted with the graphite in the proportion of three of the former to one of the latter. Nos. 2 and 3 were specimens of wrought iron made from cast iron so melted. Extensive beds of this graphite are found in the neighboring counties of Chester and Lancaster.

BIBLIOGRAPHICAL NOTICE.

Engineering Precedents for Steam Machinery; Embracing the Performances of Steamships, Experiments with Propelling Instruments, Condensers, Boilers, &c., accompanied by Analyses of the same; the whole being original matter and arranged in the most practical and useful manner for Engineers. By B. F. Isherwood, Chief Engineer, U. S. Navy; New York. H. Bailliere, 1859.

We have received the first volume of a series having the above title. It contains descriptions of the build, and accounts of the performances, with comparisons of a number of British Government steam vessels, constructed for littoral warfare by the best English makers; and the results of the trials with H. B. M. ship "*Conflict*," propelled with screws of various kinds; as well as a comparison of the effect obtained during the test trials of the U. S. Steamers "*McLane*" and "*Spencer*" to determine the relative efficiency of the paddle-wheel and screw propeller. The present volume is a valuable contribution to the library of the marine engineer; and if (as hoped,) the author will continue his labors, and publish the data and results of his experiments and his observations in the other branches of engineering practice, they must prove acceptable to the profession at large. J.

Abstract of Meteorological Observations for January, 1859*; made in Philadelphia and Somerset Counties, Pennsylvania, for the Committee on Meteorology of the Franklin Institute.*

1859.	PHILADELPHIA.—Lat. 39° 57′ 28″ N. Long. 75° 10′ 28″ W. Height above the sea 50 feet. Prof. J. A. KIRKPATRICK, Observer.															SOMERSET, Somerset Co. Lat. 40° N.. Lon. 79° 3′ W. Height 2195 feet. GEO. MOWRY, Observer.							
	Barometer, at 32° F.					Thermometer.						Relative humidity.	Force of vapor.	Rain and Snow.	Prevail'g winds.	Barometer.		Ther.		Relative humidity.	Force of vapor.	Rain and Snow.	Prevail'g winds.
Jan.	7 A. M.	2 P. M.	9 P. M.	Mean.	Mean daily range.	7 A. M.	2 P. M.	9 P. M.	Mean.	Daily oscillation.	Mean daily range.	2 P. M.	2 P.M.			Mean.	Mean daily range.	Mean.	Mean daily range.	2 P. M.	2 P. M.		
	Inch.	Inch.	Inch.	Inch.	Inch.	°	°	°	°	°	°	Per ct.	Inch.	Inches.	Direc.	Inch.	Inch.	°	°	Per ct.	Inch.	Inch.	Direc.
1	29·666	29·715	29·929	29·770	·141	37½	42	38	39·2	8	1·8	74	·199	0·158	W N W	27·581	·132	31·7	3·0	71	·139		W N W
2	30·141	30·113	30·170	30·141	·371	31	39	33	34·3	10	4·8	55	·130		N W.	27·786	·205	28·0	7.3	77	·179		W.
3	30·168	30·075	30·055	30·099	·060	31	35	30	32 0	7	2·3	75	·152	0·317	N E.	27·742	·051	28·7	5·7	79	·155		S.
● 4	29·792	29·795	29·895	29·827	·272	29½	34	35	32·8	10	2·5	79	·155		N W.	27·611	·136	27·3	3·3	95	·168	0·076	W N W
5	30·047	30·015	30·019	30·027	·200	27	37	32	32·0	11	2·8	62	·136		S W.	27·680	·094	31·0	7·7	90	·207		S W.
6	30·058	30·055	30·010	30·041	·020	32	43	40	38·3	15	6·3	67	·186		S W.	27·679	·049	37·3	6·3	68	·195	0·278	S S E.
7	29·674	29·439	29·387	29·500	·541	41½	47	42½	43·7	10	5·3	96	·311	1·209	(var.)	27·255	·425	38·7	10·0	92	·311	0·140	W S W.
8	29 719	29·821	30·029	29·856	·356	26	25	15½	22·2	12	21·5	50	·067		W.	27·562	·307	6·0	32·7	80	·051		W.
9	30·024	30·006	30·066	30·032	·176	14	22	19	18·3	10	6·2	45	·053		(var.)	27·639	·077	11·0	5·7	54	·056		W.
10	30·319	30·372	30·413	30·371	·336	0	4	2	2 0	7	16·3	73	·038		N W.	27 904	·265	3·0	8·0	35	·023		N W.
11	30·274	30·072	29·962	30·103	·262	2½	16	17½	12·0	18	10·0	66	·059		W	27·623	·280	34·7	31·7	66	·177		W S W.
☽ 12	29·975	29 896	29·924	29·932	·171	21½	32	31	28·2	17	16·2	79	·143		S W.	27·639	·068	37·0	6·3	80	·170		W.
13	29·906	29·859	29·885	29·883	·048	21½	50	43	38·2	26	10·0	51	·185		S W.	27·644	·019	40·7	4·3	70	·236	0·203	W.
14	29·783	29·614	29·560	29·652	·231	38	40	38	38·7	5	10·5	82	·203	0·238	N E.	27·337	·306	45·0	4·3	100	·335		S.
15	29 452	29·407	29·506	29·455	·197	38½	49	42	43·2	13	4.5	92	·323		S W.	27·207	·147	32·7	12·3	84	162	0·075	W.
16	29·766	29 886	29·935	29·862	·407	36	44	35	38·3	11	4·8	45	·129		W.	27·585	·378	30 7	3·3	90	·183		W S W.
17	29·863	29 838	29·962	29·888	·057	36	49	35	40·0	16	1·7	44	·152		(var.)	27·678	·093	29·3	4·7	78	·140	0·058	(var.)
○ 18	30·231	30·255	30·218	30·235	·347	29	35	29½	31·2	8	8·8	35	·072		N W.	27·959	·281	23·0	6·3	88	·147		(var.)
19	30 197	30·129	30 137	30·155	·080	28½	47	37	37·5	22	6·7	41	·133		S W.	27·871	·084	35·0	12·0	67	·186		S W.
20	30·155	30·038	30·023	30 072	·082	34	53	48	45·0	21	7·5	60	·244		S W.	27·712	·163	43·3	8·3	67	·282		S W.
21	29·823	29·659	29·744	29·742	·330	54½	50	41½	48·7	13	10·0	93	·335	1·389	(var.)	27·549	·163	34·7	13·3	100	·229	0·534	(var.)
22	29·892	29·873	30·117	29 961	·219	37	43	27½	35·8	17	12·8	59	·163		(var.)	27·720	·173	15·0	19·7	78	·095	0·073	W N W
23	30·282	30·349	30·412	30·348	·387	16½	23½	20	20·0	9	15·8	67	·084		N W.	28 001	·281	5·3	9·7	68	·067		W N W
24	30·475	30·402	30·439	30·439	·091	18	30	27	25·0	16	5·0	57	·095		S W.	27·979	·026	19·3	14·0	99	·191		?
☾ 25	30·401	30·266	30·225	30 297	·141	23½	40	34½	36 0	21	7·7	56	·138		W S W.	27·887	·092	29·3	10·0	71	·202		S W.
26	30·223	30·218	30·268	30·236	·090	31½	48	38	39·2	18	6·5	49	·165		S W.	27·924	·038	37·0	7·7	84	·262		W N W
27	30·166	30·186	30·099	30·150	·086	34	42	41	39·0	10	3·8	74	·199	1·884	N E.	27·771	·153	35·3	4·3	91	·216	0·127	S.
28	29·880	29·818	29·878	29·859	·292	51	54	54	53·0	14	14·0	93	·390	0·020	S.	27·573	·199	48·0	12·7	100	·418	0·068	S W.
29	29·831	29·827	29·897	29·852	·026	42	45	42½	43·2	6	9·8	84	·252	0·015	N E.	27·656	·084	33·7	14 3	86	·210	0·023	(var.)
30	30·076	30·041	30·142	30·086	·235	35	41	34	36·7	10	6·5	49	·125		N W.	27·838	·181	28·3	5·3	100	·174		N W.
31	30·235	30·182	30·218	30·212	·125	28	38	31	32·3	13	4·3	45	·103		N W.	27·884	·047	25·7	5·3	74	·149		N W.
Means	30·016	29·975	30·017	30·003	·206	30	38½	33⅓	34·0	13	8·0	64	·165	5·230	N 81° W	27·693	·161	29 7	9·7	80	·184	1·655	

JOURNAL

OF

THE FRANKLIN INSTITUTE

OF THE STATE OF PENNSYLVANIA,

FOR THE

PROMOTION OF THE MECHANIC ARTS.

MAY, 1859.

CIVIL ENGINEERING.

For the Journal of the Franklin Institute.

Steam and its Condensation. By Thomas Prosser, C. E.

CHAPTER V.

(Continued from page 223.)

Some Practical Suggestions on the Philosophy of Surface Condensation.

Although the promise of great saving of fuel and increased durability of boilers, has not been realized by Hall's invention* of a surface condenser, the cause does not appear to have been sufficiently investigated. One writer† attributes it to being "extremely difficult to keep it tight," which is purely imaginary and entirely at variance with every reliable authority.‡ The error probably arose from the saltiness of the water in the boilers, occasioned, not by leakage through the glands around the tubes of the condensers, but from the pumping of sea-water into them, to save the trouble of attending to the evaporator, as Mr. Hall himself states in his pamphlet, was done while he was on board, and which was only discovered by accident.

Engineers, like other people, are very apt to adopt the easiest method of supplying an immediate want, and the use of the evaporator implies the necessity of blowing off the residuum when a certain amount

* Bourne on the Steam Engine, page 64, says, "the weight and expense are formidable objections, and it does not act as a preservative of the iron of the boiler from corrosion." One vessel, he says, had 22 miles of copper pipes for the condensation of the steam.

† Note Journal of the Franklin Institute, Vol. xxi, (3d Series,) page 141.

‡ See London Mechanic's Magazine, Vol. xxxiii, page 46, and Vol. xxxvii, page 471, where the *Megæra's* condensers are reported to be in good condition after four years use, during the last three of which they had never been opened for inspection.

of concentration is arrived at, just the same as in any other boiler, the only difference being, that the scale is much softer, and therefore more easily removed.

Another objection was to the oil, grease, and other filth, which choked up the numerous small tubes, so as to require a plentiful supply of potash and hot water, and considerable poking with a stick into seven thousand ½ inch pipes, having an aggregate length of 14 miles, that being the complement of the *British Queen's* condensers.* In consequence of the coldness of the condensing water, this filth stuck with extraordinary tenacity, and the enormous quantity of cold water required for condensation, rendered an extra cold water pump necessary, while the feed water was reduced to 22° C., even after passing around the chimney.

In the sequel, I shall endeavor to show that the defect of the system, lay wholly in the low temperature of the working steam and of the condenser, and that nothing more than an increase of both was necessary to more economic action, equal in every respect to that assigned to Pirsson's method.

That Hall's condensation was almost perfect, does not admit of a doubt, and therefore it is entitled to rank as the first of its class, and has a value far beyond all others for comparison; in fact, it is the only one affording any fixed data upon which to found calculations of what may be expected under other circumstances.

Mr. Hall then allowed 2800 square inches of surface for the condensation of 60,000 cubic inches of steam per minute, at the pressure of 4 ℔s. per square inch above the pressure of the atmosphere; and he employed 100 ℔s. of condensing water on the outside of fifty thin copper tubes, each 3 feet long and ½ inch inside diameter, to do it with, and called that equal one H. P.† In other words, he allowed per H. P. 19 feet 5 inches of surface for the condensation of 1·6 ℔s. of steam with 100 ℔s. of water per minute.

In Chapter III, Table I, I have adopted for data, the workings of the "*Wilberforce*" steamer as furnished by Tredgold, (page 385,) so far as I can do so; but, inasmuch as the steam was used expansively for nearly half the length of the stroke, I have applied some of the data previously given for full steam, as I consider that the only proper basis for calculations of this kind.‡

It will be convenient to omit in our calculations, for the present, as much of the condensing surface as the evaporator may be supposed to require, for, although I have no doubt that it was used when the best results were obtained under Mr. Hall's system, it appears to have been abandoned at an early period; and in the case of Pirsson's system, it forms an entirely separate part, on paper, for it has never obtained general, if any, acceptance in practice. In my system, on the

* London Mech. Mag., Vol. xxxii, page 763.

† Repertory of Arts, Vol. iii, (4th Series,) page 78.

‡ The "*Wilberforce*" had 17·4 feet of surface for condensation, and employed 80 ℔s. of condensing water, and as the steam contained 640° C. of total heat, and the condenser was at 15° C., there had disappeared 625° C. which had gone into the condensing water, and as that acquired but 9° C., it follows that the feed-water was about 1·16 ℔s., or 1-69th of the condensing water. This shows pretty conclusively that Mr. Hall's calculation for full steam is as correct as can be expected.

contrary, although separate and distinct from the main condenser, not only is it inseparable in practice, but a heater also forms a necessary part in the arrangement.

We will therefore assume that instead of 19 feet 5 inches, 16 feet of area of surface is sufficient for the condensation of the steam necessary to furnish one H. P.

Before proceeding in this matter, it may be advisable to lay down a few succinct dogmas or *principal conditions* which *govern* CONDENSATION in *surface condensers of steam engines*, with regard to the amount of surface required. The amount of *heat*, then, which water will absorb in equal times, is in accordance with the following *conditions:*

1st. The greater the condensing surface,

2d. The greater the difference between the average temperatures of the steam entering the cylinder and condenser, and the condensing water entering and leaving the condenser,

3d. The higher the average temperature of the condensing water,

4th. The less the difference between the total heat entering the cylinder and leaving the condenser,

The greater is the amount of condensation, and a mere inspection of the Table I, Chapter III, will show that every one of these *conditions* is greatly in favor of a general high temperature.

We will therefore proceed to eliminate them with the view of obtaining the condensing surface necessary under each system, to condense the same weight of steam, assuming that Hall's, as the standard, requires 16 feet.

$$\text{Thus we have, } 8{\cdot}1021 = 16, \left(\tfrac{48{\cdot}5}{62{\cdot}0}, \tfrac{142}{212}, \tfrac{596{\cdot}1}{616{\cdot}8}\right);$$
$$\text{and, } 3{\cdot}5760 = 16, \left(\tfrac{48{\cdot}5}{89{\cdot}0}, \tfrac{142}{314}, \tfrac{560{\cdot}4}{616{\cdot}8}\right).$$

In round numbers therefore,	Hall,	Pirsson,	Prosser,
Require respectively,			
of condensing surface per H. P.	16 ft.	8 ft.	3·5 ft.
And of condensing water,	69 lbs.	13 5 lbs.	4·13 lbs.

The condensing water absolutely required by Hall and Pirsson greatly exceeds these amounts, by the amount of condensation in the cylinder, less that portion of it which is produced by external radiation. Hall's and Pirsson's condensing surfaces, it must be remembered, are required only for condensing the working steam, and not to make up for the boiler waste. To make mine comparable with them, will require but $2{\cdot}8' = 3{\cdot}5 \times {\cdot}8$; because my heater really forms a part of my condenser, as will be better understood by referring to my article "On the Power of Steam,"* where I allow 3·75′ per H. P.

A few words are also necessary in explanation of the small quantity of water (4·13 lbs.) required for condensation. It would be 5·9 lbs. but for the fact, that ·3 of the steam is merely transferred to the water in the hot-well, and is allowed to escape as steam uncondensed, as is explained more fully in another article on "Steam and its Condensation."†

Still there is difficulty in comparing the other two systems with

* Journal of the Franklin Institute, Vol. xxxvi, (3d Series), page 11. † Ibid. page 89.

mine, on account of their great dissimilarity in apparatus and principle of action in all that constitutes a condensing engine; and yet, I have been asked disparagingly, in what respect my condenser differs from any other? Says one, you *only* omit the air pump! another, you *only* condense with boiling hot water!!—and yet another, you *only* evaporate from the hot-well instead of a boiler!!!

Are not these enough? Look at the resulting consequences, and many more *onlys* will have to be added to the list before all the differences are run down: for instance,

The boiler surface required is *only* reduced from 30 to 6·4 feet.
The coal consumed per hour per H. P. is *only* reduced from 10 to 3·2 lbs.
The condensing surface required is *only* reduced from 16 to 2·24 feet.
The condensing water required is *only* reduced from 110 to 4·167 lbs.

And the weight of steam per minute per H. P. is only reduced from 1·6 to 1·00 ℔s.

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CHAPTER VI.

On the Power and other Mechanical Properties of Steam.

The "absolute mechanical power" of steam is shown in my Table before referred to* column 8. This column is the product of the pressure (column 3,) multiplied into the expanded volumes (column 7,) which *must* give the whole mechanical power in the steam beyond dispute. But there is one thing remarkable which I believe has not before been observed. It is this, for every degree (C.) of heat added to the temperature, there is an increase of mechanical power equal to one pound raised 154·40222 feet; for it will be perceived that, for each decade of °C. of the Table, (column 8,) there is a constant and uniform increase of 1544 feet, notwithstanding the chaotic appearances of the increments of column 3, and the decrements of column 7. And therefore the formula of Regnault† ($\lambda = 606{\cdot}5 + {\cdot}305\ \text{T}$,) which represents the total heat in the steam is of precisely the same structure as one representing its total mechanical power ($\lambda = 42071 + 154{\cdot}40222\ \text{T}$,) and also the rate of absorption of heat by water ($\lambda = 100 + {\cdot}4\ \text{T}$). Thus connecting these three great physical facts with each other by simple constant arithmetical increments. Could we but connect the temperature, density, and pressure of steam in a similar manner a far greater achievement would be accomplished.

But there is yet another still more remarkable coincidence which I have also discovered, between the laws of development of mechanical power by the conversion of water into steam, and the law of gaseous expansion by heat. Both these laws are in the simple ratio of arithmetical increments, and are identical with each other.

Referring again to my article "On the Absolute Mechanical Power in Steam,"* I would observe, that, column 8 was not calculated by multiplying column 3 by column 7, as may be supposed from the note to page 7, but each value was calculated by the formula $\frac{p}{t+272{\cdot}47905}$‡ as given at p. 5, and that accounts for the discrepancies in some of the

* Journal of the Franklin Institute, Vol. xxxvi, (Third Series,) p. 7.
† Memoirs l'Academie de France, Vol. xxi, page 727. ‡ Ibid. page 119.

units of value. It is of course easy now to see why it should be so, but the calculations were made before the fact was observed, that column 8 was composed of the products of columns 3 and 7, and it was still some time after that before it was discovered that the increment for each degree was a constant quantity, and still more recently that I discovered that *the same number of degrees which will double the mechanical power of air from 0° C. while its elasticity remains the same, will also double the mechanical power of steam, in its conversion from water of the same temperature and under the same tension.* The mechanical power in steam converted from water at 0° C., is stated in column 8 to be equal one pound raised 42071 feet, and as the increment for each °C. is, as before stated, 154·40222, it follows that (42071÷154·40222=) 274·479° increase of temperature will double the mechanical power as stated.

From this digression I return to the absolute mechanical power developed during the conversion of one pound of water into steam at the respective temperatures of 106° C., 130° C., 180° C., and applied to the three systems of

	Hall,	Pirsson,	Prosser.
One pound raised in feet,	58438	62144	69864
Total steam pressure at entering the cylinder per square inch,	18 lbs.	39 lbs.	146 lbs.
Back pressure on the piston,	4	5	20
Unbalanced steam pressure,	14	34	126
Per centage of power applied in power developed,	·82	·90	·98

The last line being equivalent to deducting 18, 10, and 2 per cent. for condensation in the cylinder, *omitting* all consideration of the *extra* power necessary to work the air and cold water pumps, with (it is believed) all other debatable matter.

Taking Hall again, as the standard of power *developed*, and allowing, as he did, 1·6 lbs. of steam equivalent to one H. P., we have for the power developed by one pound of steam,

lbs. raised 1 ft.

$$58438 \times \tfrac{14}{18} \times {\cdot}82 = 37275 \text{ by Hall.}$$
$$62144 \times \tfrac{34}{39} \times {\cdot}90 = 48759 \text{ " Pirsson.}$$
$$69864 \times \tfrac{126}{146} \times {\cdot}98 = 59087 \text{ " Prosser.}$$

	Hall.	Pirsson.	Prosser.
And for the weight of steam per minute per H. P.	1·6	1·223	1·009 lbs.

It appears to me very plain now, that Hall's condenser died of the same complaint as one of Shakspeare's heroines, "too much of water hast thou, poor Ophelia."

The proportions of boiler and condenser surface, as well as of fuel and condensing water, will, of course, be decreased in proportion to the feed water required, therefore making the necessary correction we have,

			Hall,	Pirsson,	Prosser,
Boiler surface required per H. P.,		feet,	30	20	6·4
Coal per hour	"	lbs.,	10	6·4	3·2
Condensing surface	"	feet,	16	6·4	2·24
Condensing water,	"	lbs.,	110	16	4
Feed water per minute	"	lbs.,	1·6	1·223	1·00

These enormous gains will create no surprise in those who have well studied the subject of heat, for the best physicists maintain that not more than from $\frac{1}{8}$ to $\frac{1}{6}$ of the whole heat developed in the furnace of the boiler, is ever converted into effective mechanical power where the vacuum condenser is used, which washes the *life* out of the steam in a flood of cold water.

I will conclude this Chapter by stating some broad and fundamental differences between my system and all others, and first as to

The Low Pressure Condensing Engine.

Must have an air pump.	Mine must *not* have an air pump.
Condenser must be cool.	My condenser must be hot.
Must be below the boiling point.	Mine must be above the boiling point.
Does not admit of vapor from condensation from the hot-well.	Admits of vapor for condensation from the hot-well.
Reduces the temperature of the steam under the delusion that it is possible to use the power obtainable therefrom, and yet not cost more to restore it than that power is worth.	I reduce the temperature of the steam only so much as is necessary to bring the water under control.

And, Secondly, whether Condensing or Non-condensing.

Their excellence depends on keeping down the back pressure on the piston.	Mine depends on keeping it up.
Must regulate the steam to the load on the engine by the increased or decreased pressure of the *working steam* upon the piston.	Mine is more economically regulated by decreasing or increasing the *back pressure* on the piston.
The Noisy System.	The Quiet System.

Russian Inland Navigation.

(Continued from page 232.)

II.—*Artificial Systems of Navigation of the West of Russia.*

In the west of Russia the river Dnieper is united artificially with the western Dwina, the Niemen, and the Vistula, by means of the canals of Berezina, Oguisk, and the Royal Jolith Canal.

Canal of Berezina, between the Berezina and Oulla rivers.

This communication was begun in 1797, and the first floats of timber passed through it in 1805.

A canal of junction, 5 miles and 550 feet long, has been dug between the lakes Plavia and Bereschta.

From the Plavia lake, toward the Berezina river, the route passes through the Manetz lake, and by the Sagolla river ; from the Bereschta lake to the Oulla river, it follows the small river of Beretcha and Esse, and traverses lake Gessaie, from which the Oulla derives its source.

The most difficult points for navigation on the Sergout and the Bereschta, as well as the mouth of the inlet to lake Gessaie and the outlet from it of the Oulla river, *are passed by means of independent canals*

along the river banks, and a canal of the same kind has been dug for the improvements of the Oulla, near the town of Tchachmiki.

The aggregate length of these canals for re-placing the channels of the streams is $8\frac{1}{3}$ miles, and the entire distance, from the confluence of the Sergout and the Berezina, to that of the Oulla with the western Dwina, is about $98\frac{2}{3}$ miles.

For this distance navigation is effected by means *of locks of wood* about 140 feet long and 30 feet broad.

The lock at the extremity near the Berezina has been built near the mouth of the Sergout, and the last lock on the Oulla is $30\frac{2}{3}$ miles near its mouth, on the canal of Tchachmiki, which replaces the river channel further up.

The object of the Berezina canal is to transport the timber of the government of Minsk towards the Western Dwina. This object has been effectually accomplished, for there are annually passed by this canal towards the Dwina and down the latter stream to Riga, timber for masts and for other purposes, valued at $562,500.

At the same time there is transported on these floats a certain amount of other cargoes, consisting of the products of the soil, but there does not exist as yet a trade by water between the Dnieper and the Western Dwina, and vice versa, by the route of the Berezina canal. If, in consequence of a future increase of industry, the necessity of such a navigation should be felt, the Berezina system would need much improvement, not only on the Berezina and Sergout rivers, but also on the Summit level canal itself, at the Manetz and Plavia lakes.

The Oghuisk Canal, built between the Yatzalda, which falls into the Bripaik, and the Stehara, which is a tributary of the Niemen, had already been began by the Polish government in 1770; and the works having been suspended, they were again resumed in 1779, by order of the Emperor Paul the First. The canal was first navigated in 1804.

The Summit Level canal, dug for a length of 32 miles, begins at the Yatzdda, and passing the lakes Voulka and Vigonostche, terminates at the Itchara.

The Vigonostche lake forms the dividing point at the canal. *The locks are of wood*, and admit the passage of boats 84 feet long and 14 feet broad, with a draft of water equal to three feet.

The sinuosities of the channel of the Itchara, which most obstruct the navigation, for a distance of $78\frac{2}{3}$ miles from the mouth of the Oghuisk canal to the City of Slomini, have been improved by means of independent canals along the river. In order to raise the level of the water, at places where the river is not sufficiently deep, five dams. with flood gates, have been built with *wooden* abutments.

On the lower part of the Itchara, from Slomini to the Niemen, retaining dikes have been built in various places, and the channel has in several places been straightened and improved.

The navigation on the Oghuisk canal is principally toward the Niemen. The principal articles carried are timber and the local products of the soil of the government of Minsk and Volhynia. About 50 boats and 2300 floats of timber annually pass through this canal.

The improvement of the navigation of the Itchara did not constitute a part of the original product for the Oghuisk canal, but was made subsequently, and there still remain some unexecuted projects for the further improvement of the stream.

The construction of the *Royal Canal*, between the Pina, which falls into the Yatzdda, and the Bug, which empties in the Marie, had been begun under the reign of Stanislas Augustus, King of Poland, but at that epoch the only work finished was the excavation of a large ravine between the sources of the Pina and Moukhavitz rivers. This ravine, filled with water in the spring, permitted the passage, during a very short period, of some floats of timber and a few boats, of a light draft, from Pinsk to Brest-Sitovsk.

The Russian government, hoping, by the construction of a regular water communication, to convert the Royal canal into a very useful channel, in a strategical point of view, and one at the same time very advantageous for developing the industry of the vast region, of which Pinsk is the centre, has often had under consideration the propriety of finishing the work already begun upon the route, but owing to various causes this idea remained unexecuted until the year 1837, when the projects prepared for the completion of the Royal canal were confirmed, and by order of his Imperial Majesty, the necessary funds were set apart for completing the work.

The projects for establishing the Royal canal were drawn up according to two different ideas; first, the opening of the navigation on the upper part of the Pina river by the canal joining this river with the Moukhavitz, and improving the navigation of the latter by means of locks; and second, the improvement of the navigation without the aid of locks.

The first of these projects would require the collection, on the summit level, of a mass of water in reservoirs much less considerable than the second, but as researches on this subject demonstrate the possibility of borrowing, annually, from the lakes situated near the Summit Level canal, nearly 137,200,000 cubic feet of water, and as, moreover, it has been found practicable to divert into these same lakes the head waters of the Pripait and the Towra; the second project has been chosen, on condition, nevertheless, that in case of extraordinary droughts, which, however, according to the statement of the inhabitants of the country, occur very rarely, there are to be built, at the two ends of the canal, temporary dams, *giving the means of feeding with the summit waters*, *alternately*, the Pina and the Moukhavitz, and to cause boats to pass in caravans or fleets, *as is practised on the Vishney Volotchok canal.*

The second project is to be preferred to the first for another reason, viz: that in constructing the Royal canal without locks, it becomes necessary to enlarge all the feeders leading into the canal, and in this way the feeders themselves are converted into navigable canals; so that, at very little cost, there is established near the Royal canal, a net work of navigable communications, contributing not only to the drainage of the vast morasses of this country, but also to the develop-

ment of agriculture and industry. Even supposing it to be necessary, notwithstanding these calculations, to construct a few locks on the upper portions of the Pina and Moukhavitz rivers, this should not cause the least modification in the plans of the canal and feeders.

The Summit Level canal, between the Pina and the Moukhavitz, is 35⅗ miles in length. On the upper parts of those streams, where the navigation is difficult in consequence of the shallowness and crookedness of the channel, canals have been built parallel with the stream. Navigable feeders unite the Royal canal with the lakes Belojai and Oraikhoffsxajai, as well as with the upper parts of the Pripait river, and other lakes contiguous to this stream. The total length of the canal feeders is 99⅓ miles.

The whole distance from the mouth of the Pina, on the Yatzolda, near Pinsk, to the confluence of the Moukhavitz and Boug, at Brstt-Gitovsk, is 144¾ miles; of this distance the Pina occupies 34⅓ miles; the Independent canal, on the upper part of the Moukhavitz, ⅔ of a mile, and the Moukhavitz itself, 62 miles.

All the work on the Summit Level canal and on the canals along the river, and also the feeders, were finished in 1842, and all the remaining work, including the improvement of the channels of the Pina and Moukhavitz proper, has since been completed.

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III.—*Improvement of River Navigations.*

Volga River.—On all its courses from Rybinsk to Astrachan, the navigation of this stream is obstructed by very few difficulties, but in ascending above Rybinsk towards Tver, and still higher as far as the source, the channel of the river is encumbered with rocky bars and sand banks. Notwithstanding that by the course of the Volga it is only 250 miles from Rybinsk to Tver, yet it took, in dry seasons, not less than six weeks to make this trip, with a draft of water of from 14 to 18 inches.

This state of things exactly in that part of the Volga which leads from Rybinsk to the Vishney Volotchok system, caused great injuries to this avenue of trade for the productions of the interior of Russia destined for exportation, and by which also the capital is supplied with the greater part of its provision and articles of consumption. The government accordingly resolved to have recourse to artificial means for deepening the channel of the river on this part of its course.

The following measures were relied upon for effecting the end in view. *Dikes*, confining the channel within narrower limits, were to be erected, *the effect of which would be to deepen, and at the same time straighten the channel.* The second resource consists in the establishment *of a reservoir* on the upper part of the Volga, *the special object of which is to feed that stream during the summer months.* The construction of the retaining dikes was begun in 1837, and in 1841 a dam with flood gates, &c., was begun in the bed of the river so as to form *a reservoir* above it in the lakes Volga, Paino, Visslouga and Stairga.

The dikes, by confining the channel within narrower limits, increased its force and tended to remove the deposits of earth in those parts where the stream is not obstructed by them, and in this way they have already produced a very useful effect, by deepening the greater portion of the bars which formerly obstructed the Volga between Rybinsk and Tver. *The reservoir* was designed with a view to its accumulating annually, at the outlet gates, a sheet of water 16½ feet deep, which is equivalent to holding in reserve 10,976,000,000 cubic feet of water during the spring floods, *to be subsequently used in filling the channel during the times of the passage of the fleets of arks.*

By these means it is hoped that the inconveniences heretofore experienced in navigating the Volga, between Rybinsk and Tver, may be obviated to such an extent that boats and arks, drawing from 24 to 26 inches of water, may ascend the stream between these points in about 20 days.

Experience has shown that the water permitted to flow in the Tvertza river from the Zavodsk reservoir, increased the depth of the channel not only in the Tvertza, but in the Volga also, for a considerable distance from the mouth of the Tvertza, and even as far as Rybinsk, when the quantity permitted to flow from the reservoir is very considerable. If we take into consideration, that the supply from the reservoir of the Upper Volga, may be five times as great as that which is drawn from the Zavodsk reservoir, during the periods when the Mstino sluice is closed, for the purpose of raising the water in the Tvertza river, we can hardly fail to be satisfied that the channel of the Volga, particularly after it has been straightened and improved, will be deepened very materially by the Upper Volga reservoir.

Timber being very abundant on the head waters of the Volga, *the whole of the constructions about the dam, waste-weirs and flood-gates of the reservoirs are of that material.* The sluices have five openings, permitting the passage of a stream of water 142 feet broad.

The Dnieper River.—A little below the City of Ekatermoslav, the course of the Dnieper is obstructed by cataracts which only permit a descending navigation, and not even this, except during the spring and autumn floods.

The cataracts of the Dnieper extend for 43⅓ miles. There are nine principal falls where even the descending navigation is exposed to considerable danger and eight rocky bars.

The government has for a long period been endeavoring to improve the navigation at these cataracts, and as far back as 1807 a lock was built at the Nainasytchik fall, which is the most dangerous of them all.

Neither this lock, however, nor the other works constructed at the same period, afforded the necessary aids to the navigation, and a careful study of the other measures to be taken, continued until 1833.

Independently of this, the affair of the improvement of the navigation at the Dnieper cataracts, was at the same time considered under a more general view, and in order that time should be afforded for them to make general investigations, His Imperial Majesty directed

that, for the moment, no partial efforts should be made to create an ascending navigation, but that all the measures adopted should be limited to the means necessary to facilitate the descending navigation throughout the summer.

The project prepared with this object contemplates the cleaning out of the channel at all the bars, and establishing at each one of the nine cataracts, above mentioned, in the bed of the stream, in the direction of the main current, a canal sufficiently deep to admit of the passage of boats; *a dike of stone being at the same time raised on each side of this canal to protect the boats from the effects of side winds;* and the channel of the river above and below the canals being straightened and improved.

In accordance with this project, the canal at the fall of Starakaidatsk was finished in 1837, this fall being the first encountered in descending the stream. The effect *completely answered the expectations*, and since then, down to the present period, the same operations have been continued at the eight other falls. These works are now completed, and at present there is under consideration a project for additional ones by means of which to render practicable an ascending navigation, and thus fully accomplish the purpose in view.

The River Tzna.—Navigation on the Tzna from the city of Moschansk, is only passable during the spring. During this short period 500 arks, carrying about 1,500,000 sacks of grain, annually descend this river. Having taken their cargoes to Rybinsk the arks return empty to the mouth of the Tzna, and habitually ascend it to the points where their cargoes for the succeeding spring are accumulating. This ascent of the empty arks is effected every year in the fall, and at this time only by the aid of the water which is suffered to flow simultaneously from out the mill dams erected on or near the Tzna.

Cargoes on the Tzna are carried in preference on arks of large dimensions, such, for example, as those of Mokshany and Gouniduki, carrying from 480 to 720 tons.

The navigation on the Tzna, in its natural state, is, during some seasons, much impeded in consequence of the shallowness and crookedness of the channel, and the want of the water derived from the mill ponds. This circumstance has constantly kept alive the solicitude of the government on the subject, and caused it to have recourse to artificial means for its improvement.

During the years 1836 and 1837 the subject was investigated for the purpose of establishing on the Tzna a system of locks from Movshansk to the confluence with the Moksoha as well as above Movshansk to Tamboff.

The question having been discussed, *it became fully evident that the construction of locks would not in the least correspond with the wants of the trade* in grain of this district, and that the measures to be taken should be limited to the amelioration of the descending navigation during the spring.

With this view a canal six miles long was dug in the valley of the Tzna during the years 1839 and 1840. This canal commenced a little

below Movshansk and extends between the villages of Moscetaspiro and Geravo, for the purpose of avoiding the sinuosities and obstructions of the channel, which, experience has shown to be most injurious. At the same time with this, there were several other improvements effected in the bed of the stream. These measures have had so beneficial an effect on the navigation that the number of arks leaving Movshansk and its environs have begun to increase, whereas formerly the number had been limited, in consequence of the dangers and retardations to which the traffic was subjected, to such an extent, that it occasionally happened that the arks could not get out of the river at all, and were obliged to lose the season.

The Western Dwina.—The strong bars on this stream, which im peded the navigation during low water, have been cleared out. In addition to this, the right bank of the stream near the fortress of Dinaburg, has been riveted with facines and raised by means of embankments, with the requisite hydrotechnical constructions, the object of the whole being to protect the fortress from inundation.

At the city of Riga there have been constructed in the bed of the river, as an experiment, *dikes for the purpose of narrowing the channel.* These dikes have been built of various dimensions, and in different ways, and various directions have been given to them, for the purpose of determining, by experience, the best means for improving and deepening the channel.

The River Neva.—This river, from its outlet from lake Ladoga to its mouth in the Gulf of Finland, has every where a depth sufficient for fully loaded boats, except at certain places in the neighborhood of Rehla, where isolated rocks and stony bars require that the channel should be cleared out. This has accordingly been done, and at present the navigation is carried on without difficulty.

Tow-paths have been built along the river banks to facilitate the towing of the boats which ascend the river.

The River Siass, belonging to the Tykhvine system, is shallow and has a rapid current. The greatest obstacle to the navigation is the fall of Geitz. At this place the river has been improved by the construction of a lock with a chamber, *connected with which is a dam, which is removed every fall.* The supports of this dam rest in cast iron sockets let into the rocky bottom of the stream, and *the whole being taken away at the close of navigation*, the ice during the spring and fall can pass off freely on the whole breadth of the river.

Artificial tow-paths have been constructed on the Siass, at the points where difficulties are encountered in consequence of the crookedness of the channel and the rapidity of the current.

The River of Soukhona.—The first few miles of this stream, after it issues from lake Konbensk, offer many difficulties for the navigation, and it occasionally happened, during very dry seasons, that it was entirely interrupted. The establishment of a lock on the canal along the stream, and of retaining dikes in the bed of the river, have not only removed these difficulties, but have, at the same time, secured the additional advantage of raising the level of the water in the Konbensk

lake, and increasing the depth of the channel on the shoals which obstructed the mouth of the Tovosovitz, a navigable tributary of this lake, belonging to the system of the canal of the Duke Alexander of Wurtemburg.

The Volkhoff River.—The rapids of Ptchefsk have been cleared out, where boats navigating the Ladoga canal, coming from the system of Vishney Volotchock, encountered obstacles arising from the shallowness of the water and the existence of detached rocks on the bottom of the river. It became occasionally necessary to lighten the boats in the fleets, to 24 or 26 inches of draft. To obviate similar inconveniences encountered on the same river, and particularly at the Volkhoff rapids, *movable dams have been employed, for the purpose of temporarily raising the level of the water.* In this way, at the least possible cost, means have been found for avoiding the much more heavy expense which the permanent improvement of the Volkhoff river would necessarily have imposed.

Goryne River.—This stream, which is one of the navigable affluents of the Pripait, has been considerably improved by the establishment of *three wooden locks.* The necessary precautions have been taken by the ministry of public works to prevent these locks from being injured by the spring floods.

Sveet River.—On this river, which joins the Ladoga and Onega lakes, there are several rapids, but the channel is almost every where deep enough, even during the low stages, for the passage of boats coming from the Marie system of navigation.

No other inconveniences are met with on the Sveet, than some very short turns in the river. These crooked channels were obstructed with detached masses of rock, but the largest of them, which were under the water, have been blown to pieces by gunpowder, and the others have been cleared away, during the lowest stages of the stream. For the reason that the decked boats on the Marie system return from St. Petersburg to the interior, tow-paths have been made along the banks of the Sveet, wherever there are rapids, so as to facilitate the ascent of the stream.

Sheksna River.—Similar tow-paths have been built in several places along the banks of the Sheksna, particularly at the Boroivmovsk rapids, where, in consequence of the velocity of the current, forty horses are scarcely sufficient to tow a single boat.

Finally, among the measures taken for facilitating navigation, must be enumerated the construction, on Ladoga lake, of four light-houses, for pointing out the way between the mouths of the Sveet, the Siass, and the Volkhoff, and the outlet of the Neva.

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*The Panama Railway.** By V. Wyatt, C. E.

There are but few public undertakings which have so much interest attached to them as the Panama Railway; connecting as it does the two large oceans of the world—the Pacific and the Atlantic—and tra-

* From the Lond. Civ. Eng. and Arch. Journal, Jan., 1859.

versing the backbone of an isthmus which hitherto had been deemed insurmountable; passing to and fro the commerce of the eastern and western parts of the world, and opening up the riches and glories of the Pacific,—this railway bids fair to assume great commercial and general importance. India, Australia, California, British Columbia, and the rich provinces of Central and South America, on the Pacific side, have had a new and direct overland route opened to them by the construction of this isthmus railway.

A casual inspection of the American isthmus and the demands of commerce would seem to dictate that a canal between the two oceans, by which the shipping of the two seas could be interchanged without breaking bulk, would have been a far more useful and commendable work than a railway. So natural is this conclusion, that from time to time various and diversified have been the projects for a ship canal between the two seas, and these projects date as far back as the Spanish Conquest. Shortly after Columbus had cruised about and discovered the Central American waters, and when the enterprising Spanish cavalier, Nunez de Balbao, had actually mounted the Andes, and espied, for the first time by a European, the Pacific Ocean, more than three centuries since,—the world became convinced of the necessity of some great work on the isthmus. There have been proposed from time to time, two different ship canals at Nicaragua—one with a Pacific terminus at San Juan del Tur, and another at Realejo in the Pacific, where the summit level in the former case is 615 feet above the sea, and in the latter about 212 feet. The latter route is somewhat circuitous and uncertain in its data. The Panama crossing of the isthmus has also been advocated, presenting equally favorable features for a canal as it does for a railway. There are no abrupt elevations and depressions; the distance can be made the shortest possible across the isthmus, being only about 30 miles in a straight line; and its greatest elevation above the mean level of the two oceans, by careful selection of country, need not exceed the highest point of the Panama Railway, which is only 263 feet, and this summit height being of very short continuance. Then there are the Darien and Atrato routes; the former of which is much controverted, and its assumed data are insufficiently supported by reliable surveys, the summit being stated by one exploring party to be all that the mind can desire, and by another and more recent exploration as beset with mountain ridges and insurmountable obstacles; the latter route (the Atrato,) has the objection of lockage up the rivers which descend from the summit each way, and it is very circuitous. There is no difficulty about the level of the two oceans, as the mean tide level of each are identical, the only difference being that the spring tides in the Atlantic are only about 18 inches, whereas in the Pacific they are from 10 feet at San Juan de Nicaragua, to about 18 feet at Panama Bay.

The climate of the coast of Central America and the isthmus of Panama, is of the most unhealthy character, and quite unfitted for Europeans. The atmosphere is hot, steamy, damp, miasmatic, and fever generating. The European when he lands on this coast, feels his en-

ergies relaxed, and his whole spirit depressed. This was the greatest difficulty the pioneers had to contend with in the construction of the Panama railway. The railway works were of a light character, and would have been deemed trivial in healthy spots; but when the theatre of operations was the isthmus of Panama, then the problem was, not merely to organize men for their work, but how to keep workmen alive in such a pestilential place, continually attacked as they were by intermittent fevers and agues. Every gang of men was being continually broken up by disease, desertion, and excessive mortality. It has been stated that 10,000 men lost their lives in the making of this railway, and that the sleepers in the line count the numbers of bodies buried there; but this calculation, like many other popular rumors, is of course over-estimated. It is very certain, however, that the company did import on to the isthmus during the time the works were going on more than 3000 Americans, Irish, Chinese, and Negroes, besides the casual supply of labor which found its way to the works from time to time. The major part of these men fell victims to the isthmus fevers; the Chinese committed suicide to a wholesale extent; many succumbed to their intemperance and irregularities under a tropical sun; and some, including many shrewd Americans, "cleared off," and departed from the isthmus as soon as the seeds of disease or the horrors of the spot became apparent to them. The inconveniences and risk of working in such a climate may be imagined from the fact that the temperature on the isthmus is from 82° in the morning to 90° mid-day Fah. in the shade, and this continued all the year round, with no greater variation than 5° or 6°; and accompanied with this is the unhealthy steam from a tropical rainy season extending over eight months in the year. The sea water in the two oceans adjacent to the isthmus, taken at ten feet below the surface, averages 84° Fahrenheit.

The Panama Railway starts on the Atlantic side from Navy Bay, at a point called by Europeans and New Granadians, Colon, and by the people of the United States, Aspinwall, after one of the railway promoters. Colon or Aspinwall town, which has been created by the railway, has a very backwoods-settler look about it, being composed of wooden houses, stores, shops, and hotels, and has only one permanent looking structure, viz., the railway freight and store-house, built of stone with an ordinary iron roof of 78 feet span. The American engineers point to this as the very *chef d'œuvre* of engineering. Aspinwall is on the eastern side of Navy Bay, on an almost submerged coral reef, standing only about three feet above the Atlantic. It is a wet, swampy, and aguish-looking spot; the rains are incessant; and yellowish-white unhealthy looking faces are visible everywhere amongst the railway employees and residents. Panama is considered a wet place, but in comparison with Colon or Aspinwall, it sinks into insignificance; the railway rain-gauge at the latter place showing a register in one rainy season of eight months, of 110 inches of rain. England is called wet with an average of 26 inches of rain for the year. Behind Aspinwall is a rotten swamp for miles, the miasma from which salutes the nostrils of the voyager when landing; and he is moreover

advisedly informed that a residence of more than twenty-four hours for a new comer, will probably introduce him to a tropical fever. The old outlet on the Atlantic side for the mule travel of the isthmus was at Chagres, situated to the west of Navy Bay, being at the mouth of the Chagres river; and a never-to-be forgotten place by Californian travelers, who have so often left the bones of their friends on its miserable shores.

The railway after leaving Aspinwall crosses the dismal swamp before alluded to for a distance of seven or eight miles ere it reaches terra-firma; it then escapes from this floating bog, with all its rotten, rank, tropical vegetation. The greatest amount of mortality resulted on this part of the line in the first construction; here not only from the unhealthfulness of the situation, but also from a total absence of any properly organized commissariat to supply the men with the necessary and proper comforts; and also allowing the free circulation on the works of the raw spirits so cheaply imported on to the isthmus from the West Indies. Various were the expedients adopted by the American engineers in this swamp to form a foundation for the road, and to economise labor, time, and expense. Crib-work (the American term for large wooden boxes, formed of large timber logs, which are loaded with stones or gravel and sunk into position), fragile and temporary trestle-work, and staging on piles. All these methods have rotted and nearly disappeared, as might be expected in a climate where the durability of timber is estimated by months instead of years; and this fragile and temporary work is being substituted, or rather buried up by a filling-in of good, hard, dry, rocky material, with occasional tips of clay to bind the whole together in one mass, enclosing in its bulk the original piled staging and crib-work; the material being obtained from side cutting on the Panama side of the swamp. There is one merit however in the swamp part of the railway, which is that it is the only direct and straight part of the line; most of the rest being very circuitous, and laid out in a succession of serpentine curves, on precipitous sidelong ground.

The clearing of the railway from bush and jungle was attended with considerable risk, having to be done two or three times over during the progress of the works, the growth of vegetation being so prolific here. Now that the line is completed and opened, the clearing is still a work of some expense, and has to be done twice a year by negroes, or the course of the line would be grown up and invisible. In the first attempts at clearing away the jungle, the pestilential insects were an insufferable nuisance to the men; and frequently have they been driven from their work before a cloud of mosquitoes, sand-flies, garropatas, and venomous tropical insects.

From the dismal swamp the railway winds its course tortuously, and in the shape of an almost succession of reversed curves, through the summit and all the way to Panama. These curves are reversed 4°, 6°, and 8°, (which is the American notation for curves of the respective radii of 1432, 955, and 716 feet,) without any straight line to ease the reversal, and not always with the outer rail elevated. The winding

course of the line may be conceived of from the fact that the isthmus in a direct line is only about 30 miles wide, but the distance by railway from Colon to Panama Bay is 48 miles. The course is very ingeniously picked out in the vicinity of the summit, taking every available ravine and opening to its assistance; running sidelong on the banks of the Chagres river in dangerous proximity for miles, and turning at times to every conceivable point of the compass, giving the traveler occasional views of tropical luxuriance; taking awful twists and bends to avoid cuttings of 8 or 10 feet in depth; and at last clearing the summit of the isthmus 10½ miles from Panama and the Pacific, with a cutting only averaging about 20 feet in depth and 500 yards long. The greatest grades are 60 feet to a mile, the curves are anything you like, and the maximum elevation to which the locomotive ascends is 263 ft. above the mean tide levels of the two seas. Before the railway was explored and constructed, the isthmus had been surveyed by various scientific individuals, who maintained that a less summit could not be found at Panama than about 400 or 500 feet above the sea. But railway engineers soon destroyed the hypotheses of learned explorers (who so often write about nature, but do not attack her,) and by a good deal of pluck and energy, and a small amount of science, brought the project to a practical issue.

The isthmus presents many picturesque tropical beauties between the Aspinwall swamp and Panama. There are the varieties of palm trees, more than twenty in number, with their clusters of scarlet berries; the cocoa-nut tree with its graceful feathery branches; the gigantic flowering tropical lilies and cactus; the plaintain, prickly pear, and gay flowering shrubs and creepers; and the impenetrable jungle or tropical thicket, clothing the ravines with a dense cover of vegetation, and giving to their undulations a gorgeous clothing.

The earthworks upon the railway are but trifling; there are no large cuttings, (the largest being the summit one mentioned above,) and no very large banks. The bulk of the material for the banks was taken from patches of side cutting taken at the nearest and most convenient points, regardless alike of appearance or finish. Necessity was the order of the day, and style and order had to succumb. These slopes are not trimmed, or even formed at all like slopes, the cuttings being taken out vertically, and allowed to form themselves, and they have formed themselves truly, with the assistance of the tropical rains, into very wild shapes. Nature, here so prolific, however, steps in frequently and clothes their deformities by a tropical covering of vegetation. The tops of the banks are shaved down in too many cases to a nicety, being not more than 10 or 12 feet broad at the top, and cut into and guttered up severely by the tropical rains, for want of a proper sodding. Near the summit this deficiency of embankment gives the line a very dangerous look, and especially so where its slopes are washed by the Chagres river. Diversions of the line and sacrifice of good alignment are visible in some places where work has been cut down to its minimum, and pushed through at any sacrifice.

The bridges which were first constructed upon the line were of the

true wooden, temporary, and American type, having a very stagy look about them, and not intended for inspection by posterity. They were in some cases nothing more than trestle-work of the rudest description, and quite unsafe for trains of more than four or five miles per hour. These, however, thanks to the rapacities of a tropical climate, have gone the way of all that is perishable, and crumbled into dust and tropical mildew. Wrought iron boiler plate girder bridges, both for large and small spans, resting upon stone abutments, have been substituted. They are of the simplest character, and have a lean, skeleton appearance. Each bridge is only composed of two ordinary girders, placed directly under each rail, with nothing over them but the common cross-sleepers of irregular lengths, and the rails then spiked to these. No planking, no parapets, (although the bridges are frequently placed on very ugly curves, and the train jumps as it mounts them,) and the bridges *in toto* resemble an ill-constructed gridiron. The masonry is bold, rough, and good, prepared from a blue granite and whitish freestone which are found on the line, in the execution of which negro labor, as in all other classes of work on the isthmus, is largely employed under white superintendence. These bridges have cost a heavy sum, as they have all been constructed on the wrecks of the old ones, since the opening of the line in 1854, and whilst the ordinary traffic has been going on. The iron bridge over the Chagres river, about half way across the isthmus, is the largest and most important work on the line; it has six openings of a hundred feet span each, spanned by as many pairs of boiler plate girders, arranged in this example to form the parapets, with small cross girders, and upon these last the longitudinal timbers are fixed to carry the rails. The whole, however, is left gridiron shape, without planking or finish. It is adapted for a single line only. The upper sides of main girders are curved, which gives to the upper lines of the bridge a wavy and unpleasing appearance.

The permanent way is of the roughest character; being laid and maintained by negro labor, its correctness as to line, level, and finish may be easily judged. The rails are, however, generally good, and of the bridge-rail section, weighing 68 lbs. to a yard. Some short distance of the line is laid with the common Yankee foot-rail, or, as it is sometimes termed in England, the contractor's rail. The rails are fastened to the intermediate sleepers by common spikes weighing less than a pound each, and at the joints are secured very roughly by a small boiler plate chair (8 lbs. weight) and four spikes. This is the universal American system of fixing rails. The rails might, however, have been slotted at one end, through which two of the spikes pass and secure the rail to the chair, and prevent it from sliding. The bridge rails used here were evidently intended for longitudinal timbers; for there are the holes in the flanches for the screw bolts which secure the rails to the continuous timbers. The sleepers now used are of lignum vitæ wood, fetched from Carthagena on the Atlantic side of the isthmus, and cost, when delivered, 6*s*. each. The sleepers originally used (pine) on the line have wholly disappeared; they only lasted from two

to three years. The lignum vitæ sleepers are reported to be of no longer duration than about twelve years. The ballast was omitted from the line almost entirely in its first formation, and now it is not universally used throughout, being put on in patches from time to time, where it is found to be all important to keep the permanent way from being washed out of position by the tropical rains. It is principally formed of broken rock and coarse gravel, both of which are plentiful on the line; it is used sparingly, however, the sleepers being generally on the soft material on their underside, with broken rock packed between.

The traveling on the railroad is very slow, averaging not more than ten or twelve miles per hour. The grades, however, are not excessive, not exceeding as above stated a maximum of 60 feet in a mile; but the locomotives are weak and asthmatic, and they frequently stick on these inclines with very ordinary trains, and the passengers sit under a broiling tropical sun at the bottom of a cutting, with only an inch board intervening between them and the sun, frequently for an hour together. This is not very pleasant when each passenger pays £5 3*s*. for the fare to cross the isthmus, and 6*d*. per pound for all his luggage over fifty pounds weight, which, with something like an ordinary amount of luggage, comes to about 2*s*. 6*d*. per mile per head. The black negro engine drivers too take a long time to pull up at an intermediate station, swinging backwards and forwards in its vicinity for about a quarter of an hour, like the pendulum of a clock. The locomotives and carriages are of United States build and fashion, only a shade worse. There is the bull-whistle to the locomotive, with its funny little wheels in front on a bogie frame, turning on a swivel-joint, and its broad-topped ugly funnel for wood-burning. The carriages are common and dirty, with no double casing to the top to screen the intense heat of a tropical sun, Venetian slides for windows, and hard seats. The station-houses along the line are mere palm huts (excepting at Aspinwall and Panama), and their vicinities have a wild uncivilized appearance, with the black, nude negroes hovering about in all the crudities of uncivilized life.

At Panama, the terminus of the line on the Pacific side, the station has no conveniences of any kind for travelers; no offices for washing, refreshment, and other purposes. The traveler from California to the United States often finds himself here in company with some 1000 or 1200 persons, just arrived by a Californian steamer, suffering from tropical disorders, and no means of comfort at hand, not even civility.

The total cost of the line has been about £27,000 per mile, and the engineer-in-chief from the commencement to the present time has been Colonel Totten, an American. The railway pays a dividend of 12 per cent. per annum, with its present undeveloped traffic.

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*The Railway Work of the Session.**

It appears from an official report issued by the Board of Trade that 192 railway and canal bills are now before Parliament. Of this number, 129 bills authorize new works. In England 61 bills have been

* From the London Mechanics' Magazine, Feb., 1859.

introduced by new companies seeking powers to construct 638 miles of railway; in Scotland five bills, referring to 53 miles, are brought forward by new companies; and in Ireland four bills, referring to 77 miles, are introduced in a similar manner. As regards the movements of existing companies, they have introduced 43 bills for 154 miles of new lines in England, six bills for 78 miles of new line in Scotland, and ten bills for 129 miles of new line in Ireland. The total length of new line proposed is, therefore, 1129 miles, and there are besides 95 miles of deviation lines, and twelve projects for the enlargement of stations.

On the Successful Working, by Locomotive Power, over Gradients of 1 *in* 17, *and Curves of* 300 *feet radius, on Inclines in America.** By Mr. T. S. Isaac.

[Read before the Institution of Civil Engineers, Nov. 23, 1858.]

It was stated, that the road which had decidedly taken the lead in the United States, in the application of locomotive power to steep gradients, and had been generally the pioneer of improvements, was that extending from Baltimore, on the Chesapeake Bay, to Wheeling on the Ohio river, a distance of three hundred and eighty miles, through a region of considerable difficulties, especially in the various ranges of the Alleghany Mountains. This Company was incorporated in 1827, being the first chartered in America, and a portion of the road was opened in May, 1830. At first it was worked by horses, but locomotives were employed as early as August, 1830,—prior to the opening of the Liverpool and Manchester Railway. It was not until 1851 that the great incline over the main range of the Alleghanies was completed and worked by locomotives. It had an inclination of 1 in 45½ for 11 continuous miles, and, after winding amongst the summits of the mountains for twenty miles, it descended, on the western side, with an inclination of 1 in 45½ for nine continuous miles. The passage of this mountain chain involved altogether sixty miles of railway, twenty miles of which had a gradient of 1 in 45½, and nine miles of 1 in 50, both worked by locomotive power, at a speed of from fifteen to twenty miles per hour for passenger trains, and from ten to fifteen miles per hour for goods trains. The curves were frequently 600 feet radius. Although it was one of the main thoroughfares of American commerce, no extra provision was made for working these inclines, beyond incresing the number of the engines. The engines had eight wheels, all coupled, the diameters of the cylinders being 17 inches, the length of the stroke 2 feet, and the diameter of the wheels 4½ feet. The engines weighed 24 tons each, and the tenders 13 tons each.

In 1852 difficulties were encountered at two different tunnels, which rendered temporary inclines necessary, in order to accomplish the passage of the trains. This system was frequently adopted when it was required to surmount hills where the tunnels were incomplete, in order to enable the iron and other materials for the permanent way to be

* From the London Mechanics' Magazine, December, 1858.

delivered along the line. There was a maximum gradient over the Kingwood tunnel of 1 in 10, and this incline was in operation for several months, the iron and other materials for upwards of forty miles of line, and the United States mails have been conveyed over it by locomotive power. The same engine that was used on the other parts of the line was employed, and it drew a loaded car weighing 13 tons, and a tender weighing 12 tons, or a total weight of 25 tons, at the speed of 8 to 10 miles per hour. Over the Board Tree tunnel there was a series of zigzag inclines, on which the upward motion of the train was alternately reversed, the engine at one time pulling, and at another pushing the cars. There were three of these inclines on the Eastern, and five on the Western slope of the hill. The total length was nearly two miles and one-third, and the gradients varied from 1 in 18 to 1 in $15\frac{1}{2}$, with a minimum radius of curvature of 300 feet. The ordinary freight consisted of two loaded cars, weighing, together with the tender, 37 tons. Mr. Latrobe, the chief engineer of the line, said, in his report for 1853, that as many as fifty cars, containing 400 tons, and two passenger trains, had been taken over this hill in a day by four first-class locomotives; and that, during five months, there had been no accident involving more than a trifling detention. These two inclines, although unprovided with engines especially adapted for the purpose, fully demonstrated the feasibility of traversing gradients, altogether unprecedented, by the locomotive alone. The experience gained in working them not only established the fact, that a rise of 300 feet per mile, and curves of 300 feet radius, could be worked with comparative facility, but seemed to point also to a limiting gradient, beyond which it was impossible for the locomotive to go, with any useful effect, even for a temporary purpose.

Steep gradients and sharp curves had since been adopted on the Virginia Central Railroad, on a more extended scale, and had been in successful operation for upwards of four years. The Mountain Top incline on this road crossed the Blue Ridge Mountains at Rock Fish Gap, in Virginia. This incline was fully described at p. 245 of the 66th vol. of the *Mechanics' Magazine.**

The author believed that the resistance of the curves had been underrated in America. On the Mountain Top incline it was proved that the resistance of the curve exceeded $25\frac{1}{2}$ lbs. per ton of engine and train. Mr. Latrobe had calculated that the resistance to traction, on a level, was doubled by a curve of 400 feet radius; and he assumed 13 lbs. per ton as the additional friction of the train, on a curve of 300 feet radius, whence the additional friction of the engine, due to such a curve, must have exceeded 49 lbs. per ton of its own weight. Two expedients had been resorted to for diminishing this friction. On the Baltimore and Ohio incline, for a speed of ten miles per hour, the outer rail had been gradually raised, on a curve of 300 feet radius, from 2 inches, the height given by the ordinary formula, to 9 inches. On the Mountain Top Track inclines, for a speed of 8 miles per hour, the outer rail had an elevation of $6\frac{1}{2}$ inches; and a sponge, saturated with oil, was kept in contact with the flanches of the two forward wheels

* See Journal of the Franklin Institute, Vol. xxxiii., p. 217.

of each engine. These expedients had so far reduced the friction on the latter road, as to cause no perceptible diminution of speed on leaving a straight portion of the track, with a gradient of 296 feet per mile, and entering a curve of a radius of 300 feet, having a gradient of 238 feet per mile.

The Virginia Central Company had also constructed a shorter incline, about 100 miles further west, which was one mile and-a-half in length, with gradients varying from 250 to 300 feet per mile, and curves of a minimum radius of 400 feet. Over this incline, which had been in successful operation for two years, the common freight engines, on eight wheels, four of which were coupled, giving 16 tons for adhesion, had taken a load of 36 tons, at a speed of five miles per hour.

The ordinary performances of the engines on the Mountain Top Track, showed an exertion of 181½ horse power, including the engine in the load, or 118 horse power not including the engine; giving, in the latter case, 4·8 horse power per ton of motor, the resistance due to the speed and the gradient being 121·64 pounds per ton.

On one or two occasions, on the incline of 1 in 10, on the Baltimore and Ohio line, the weight of the engine being four and three-quarter times the resistance of gravity and the friction of the load, when the rails were very greasy, the engine and train slid backwards with locked wheels, from near the top to the bottom of this incline, without damage. The wheels of these engines had chilled tyres, a circumstance which considerably decreased their adhesion. The engines on the Mountain Top Track, with an ordinary train, exercised an adhesive power of one-sixth of their weight, and this could always be maintained, in the severest weather, by the use of a fine clean sand.

In conclusion, the author remarked, that there were probably few mountain passes that could not be overcome by the introduction of gradients of 1 in 17, and experience had satisfactorily proved, that the locomotive could draw a load nearly double its own weight up such a gradient, at a speed of eight miles per hour. The working of the Mountain Top Track furnished additional evidence to that already gained from other sources, of the superiority of light engines with light loads, over heavy engines with heavy loads.

(To be Continued.)

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*Fall of Stone Staircase at the Polytechnic Institution.**

Late on Monday evening last, (Jan. 3d, 1859,) at this Institution, a very deplorable event occurred, resulting in the death of one person, and serious injuries to six others, of whom three can hardly be expected to survive, besides more or less wounding some twenty other persons. It appears that after about 800 of the audience had left the building, the staircase (on the left-hand going in), well known to most of our readers, was being descended by the remainder of the thirty or forty lingerers, who always wait to see the complete exhibition, when

* From the London Builder, Nos. 831 and 834.

those upon the middle flight were hurled to the bottom of the well of the staircase by the fall of that flight of steps on to one below it, carrying the under one also into the basement. The immediate assistance of police force and the officials of the Institution saved the surviving sufferers, almost all females, from the immediate perils of their position.

Pending the coroner's investigation, we shall abstain from any comments upon this additional disaster in the midst of the festivity of the new year, in order that no injustice may be done by casting blame in wrong quarters.

The steps are of Portland stone, feather-edged, and were put up twenty years ago, under the direction of Mr. James Thomson, the architect of the building. Not long ago the treads having become worn, open iron work, the interstices filled in with cement, was let in on the face of them, and it has been urged by some that cutting into the steps for this purpose has led to the calamity. The iron facing on each step weighs about 1 cwt. Each step probably weighs $2\frac{1}{2}$ cwt. On the other hand, it is stated that the fall commenced at the upper landing, and that it has been found that the joggle here was not soundly made.

The appearance presented by the staircase is most extraordinary; every step being broken sharply off about 4 inches from the wall. The accident will not fail to inspire the gravest considerations.

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A jury, under Mr. Wakley, coroner, met on Thursday morning last, and, after viewing the body, adjourned for a week, to enable two architects, unconnected with the establishment, to examine and report on the cause of the accident.

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On Monday last, (Jan. 24,) the inquest on the death of the girl killed by the falling of the staircase at the Polytechnic Institution, was resumed; and, after a discussion as to the propriety of taking further evidence including that of the architect of the building and alterations, the coroner summed up, and the jury found a verdict of "accidental death," also expressing belief that the fall "was occasioned by the cutting for the insertion of the iron trellis-work and brackets, and by the incautious manner of doing the work." They further added, that they could not allow the opportunity to pass "without expressing in the strongest manner their opinion that all public buildings should be subject to a periodical inspection." A competent person, appointed by the Government, should certify to some office, prior to the granting of a license for a building intended for public assemblage, that such buildings had been erected and finished in all its parts in a manner suitable to the purpose; and the like inspection, certificate, and license, should be necessary upon occasion of all alterations or repairs of importance. The jury also strongly objected "to the almost irresponsible power now vested in the hands of companies and individuals in the erection and maintenance of our public places of resort," and wished "to impress upon the Government the absolute necessity of not allowing the ensuing session of Parliament to pass without some enactment to enforce these suggestions." Such a course they "deemed imperative to

allay the fears of the public, in consequence of the accidents that have so frequently taken place," and hoped the coroner would forward the suggestions to the Secretary of State.

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*Stone Stairs.** By Richald R. Brash.

The late disastrous accident at the Polytechnic reminds me of a similar one which occurred in the Commercial Buildings of this city (Cork) two years since, but happily without loss of life. The staircase leading from the vestibule to the great hall suddenly fell, the Portland stone steps breaking off within four or five inches of the wall into which their ends had been inserted.

These steps had undergone a similar process to those at the Polytechnic, having had plates of cast iron inserted in the edges of the treads, about 4½ inches wide. As they had previously been somewhat worn, these plates extended to within 5 inches of the wall bearing, and every step broke at the end of the plate.

Architects should be very careful in the selection of the material for the staircases of public buildings; and people generally should be very careful in meddling with them when once up.

It is a singular fact, that in the latter instance no person was on the staircase when it fell, though some few weeks previously it had been loaded to its utmost capacity.

* From the London Builder, No. 832.

AMERICAN PATENTS.

List of American Patents which issued from February 22, to March 28, 1859, (inclusive,) with Exemplifications.

FEBRUARY 22.

231. Method of Operating Reciprocating Saws; T. J. Alexander, Westerville, Ohio.

Claim—Reciprocating the saw by means of right and left hand rocking levers or drivers, jointed to, or otherwise connected with, the saw, when said levers are separately hung or pivoted and geared together for reverse action, and so arranged as to admit of being worked by the hands of the operator.

232. Preparation of Artificial Fuel; Henry Adolphe Archerau, Paris, France; patented in France, August 11, 1856.

Claim—Producing artificial fuel by stirring, mixing, or incorporating coal dust or small coal, peat, turf, lignite, or other combustible substances, with rosin, pitch. tar, or other resinous, bituminous, or carbonaceous matters or substances, in any suitable proportions, according to the nature of the materials employed, and by causing steam, hot air, or gases, to pass through the mass during the stirring or mixing operation, or while the carbonaceous and bituminous particles are in motion. Also, mixing vulcanized carbonaceous matter with melted pitch, tar, or other bituminous substances, when the latter are worked up into a frothy state.

233. Apparatus for Destructive Distillation; Luther Atwood, Brooklyn, New York.

Claim—The arrangement and combination of the combustion tower, distilling tower, and steam blast, or their equivalents, in combination.

234. Machine for Jointing Staves; Henry Benter, Wheeling, Virginia.

Claim—1st, The carriage, provided with rollers, and used in connexion with the adjustable guides and rotating cutter head. 2d, The adjustable plate in connexion with the stationary jaw and sliding jaw, attached to the carriage.

235. Measuring Faucet; Edmund Bigelow, Springfield, Massachusetts.

Claim—A self-measuring faucet, whose supply valve is closed and discharge valve opened by a single movement, and whose discharge valve is closed and supply valve opened by a single movement produced by a spring, and which is supplied with a vent pipe for letting out the air, and another vent pipe for letting in the air when the faucet is to be discharged, which last vent pipe is shut off when the faucet is to be filled or is standing full.

236. Casting Stereotype Plates; Wm. Blanchard, Washington City, D. C.

Claim—Casting stereotype plates for printing by immersing a metallic mould plate, with a mould or matrix formed upon and adhering to it. Also, the manner of casting any number of stereotype plates by immer-

sion, or otherwise, in which each mould plate holds, on one of its sides, a matrix, whereon the face of the stereotype plate is cast in one compartment, while its reverse side, in any compartment, is used as a matrix whereon to cast the back of another stereotype plate.

237. Propeller for Canals; Benjamin Burling, Buffalo, New York.

Claim—Propelling canal boats, or other craft, by means of a steam tug placed within a well hole at the stern, and connected therewith by the shackle and stancheons, or their equivalents.

238. Water Wheel; N. F. Burnham, Laurel Factory, Maryland.

Claim—1st, The concave hub, in combination with the bucket which forms the wheel. 2d, The chutes or guides, in combination with the wheel by which one-fourth, one-half, three-fourths, or all the water, can be admitted to the wheel, and in each case get the same per centage from the amount of water used.

239. Machine for Bending Wood; Alonzo Chubb, Painesville, Ohio.

Claim—1st, The combination and arrangement of the strap with the guides, in the manner set forth. 2d, Making the guides adjustable by the use of the slots therein, and of corresponding ones in the bed timbers.

240. Triangular Stand for Furniture; Thomas W. Currier, Lawrence, Massachusetts.

Claim—The arrangement of the triangular plates with legs on the axle, as specified.

241. Vegetable Cutter; Wm. C. Davol, Fall River, Massachusetts.

Claim—The bed-plate, having the hopper attached, provided with the follower, the vibrating plate lever provided with the double-edged knife and hook and attached to the bed-plate.

242. Boot-jack; Henry N. Degraw, Green Island, New York.

Claim—The arrangement of a guide piece for the purpose of operating the jaws, in combination with a swinging platform, which rests on pivots at points between its front and back ends, so that it can be operated by throwing more or less weight on the heel or on the toes of the foot placed on the same.

243. Meat Cutter; Benneville Dewalt and Charles E. Schrader, Reading, Pennsylvania.

Claim—The arrangement of the knives in a screw form in different directions from the ends of the cylinder to the centre thereof, to discharge the meat at the adjustable opening in the bottom.

244. Cricket Bats; M. Doherty, Boston, Massachusetts.

Claim—1st, Constructing the blade of the bat of a wooden shell with a filling of cork, or other materials. 2d, Constructing the handle of the bat of a wooden tube with a central strip of whalebone, or other elastic material of similar character, running down into the blade.

245. Machine for Bending and Setting Springs; John Evans, New Haven, Connecticut.

Claim—1st, The adjustable or sectional bed, formed of the bars connected to the weights, and arranged as specified. 2d, The adjustable clamps or straighteners formed of the strips placed on rails or bars. 3d, The adjustable or sectional bed formed of the bars. and the adjustable clamps or straighteners, formed of the strips placed on the rails, in combination with the adjustable dies.

246. Pump; James L. Fagan, Anaqua, Texas.

Claim—The cylinder and hollow shaft, connecting with each other and having a reciprocating partially rotating movement, when said cylinder is perforated and provided with valves, and also provided with the piston, and with the stationary plate fitted within it.

247. Coffee Pots; James H. Freeto, Wheaton, Illinois.

Claim—The arrangement of valves in the condensing chamber in connexion with the pipes, whereby the steam which escapes through the valve is carried off and deposited in a liquid state into the spout, while at the same time, by the action of the steam, a jet of cold water is admitted into the chamber. Also, closing the opening through which the spout communicates with the coffee pot, by means of a flat valve which is operated by a rod. when the same is applied to a coffee pot which is hermetically closed by a gasket, in connexion with the air tube.

248. Moulding Covers of Cook Stoves; George W. Gardener, Troy, New York.

Claim—Combining with that part of the pattern which gives form to the recess of the cover, the pivoted projections.

249. Ploughs; John M. Hall, Warrenton, Georgia.

Claim—The arrangement of the adjustable coulter bar, point, holes, shoe, mould-board, adjustable screw bolt, attachment, pins, key, bolts, and slot in beam, as described.

250. Clothes Rack; Winfield S. Foster. Marilla, New York.

Claim—The combination of the rods and heads with the side pieces of the expanding clothes rack, in the manner specified.

251. Plough Beams; John S. Hall, Manchester, Pennsylvania.

Claim—An iron or steel plough beam, of an inverted U form throughout its main length, and welded or compressed at its ends, and so made as to be capable of receiving the top of the standard into its hollow portion, and be otherwise conveniently connected to or with the other portions of the plough, and so as to make a cheap and efficient junction of the several parts thereof, and produce a cheap, strong, and durable plough beam.

252. Machine for Cutting Straw and Hay; W. O. Hickok, Harrisburgh, Pennsylvania.

Claim—The arrangement, in combination with the upper or yielding feed roller and the cutter shaft of the coupling lever, when the said lever connects the said feed roller with the cutter shaft, by having its fulcrum around the said shaft, and also carries the pinion, which connects the pinion of the shaft with the spur-wheel of the near journals of the feed roller, the journals of the said feed roller working in grooves which are curved, so as to be concentric with the said cutter shaft.

253. Railroad Splice for Railroad Track Bars; Charles Hilton, Albany, New York.

Claim—Deep wrought iron fish-plates secured to the sides of the rails by bolts or keys, and extending downward below the base of the rail, in combination with the gib and wedge.

254. Horse and Ox Shoes; N. E. Hinds, Cooperstown, New York.

Claim—The curved or semicircular form of the heel calks, with the corners thereof turned inwards or towards the central part of the shoe.

255. FOUNTAIN BRUSHES; L. B. Hoit, City of New York.

Claim—A marking brush, consisting of a cistern which is provided with a stationary valve, and having the brush attached to a conical tube which fits into a shell.

256. HARVESTERS; Moses G. Hubbard, Penn Yan, New York.

Claim—The combination of the curved portion of the finger bar hinged at a. with the spring, forming a yielding and elastic corner or point of attachment of sufficient strength to securely connect the cutting apparatus thereto. Also, the auxiliary adjustable spring, or its equivalent, as described.

257. STEAM BOILERS; Edward Kendall, Cambridgeport, Massachusetts.

Claim—1st, The arrangement of the water walls, the suspended water spaces, flues, fire-box, lower and upper smoke boxes, and tubes, within the shell of the boiler, as set forth. 2d, In combination with the described arrangement of water spaces and heating surfaces, the arrangement of the hollow fire-bridge, the pipes, the cylinder, and pipes. 3d, The arrangement of the passages for the gaseous products of combustion, the exhaust steam, and the air in the air-heater, as set forth.

258. PACKING BAR LEAD; Zebulon Kinsey, Dubuque, Iowa.

Claim—The use of the bar or bolt when inserted in perforations made in bars or ingots, and clenched or fastened in the manner described.

259. STEAM PRESSURE GAUGE; Thomas W. Lane, Meredith, New Hampshire.

Claim—1st, So combining the indicating tube with the pipe through which the pressure within the boiler is transmitted to the gauge, that the length of tube in either direction from its junction with the pipe shall not exceed a semicircle, and placing the tube in such a position that it shall descend at every point towards its junction with and drain back into the pipe. 2d, Joining the pipe from the boiler with the indicating tube at a point between its two ends, and bending the latter so that the ends of the tube shall be nearly over the points where its two branches are rigidly supported, whereby the tube is rendered less sensitive to the vertical shocks to which it is subjected. 3d, Bending the two portions of the indicating tube symmetrically, or nearly so, upon opposite sides of a vertical line, and connecting the two extremities of the tube with the lever, for the purpose of preventing the horizontal vibrations of the tube from being transmitted to the index hand. 4th, Pivoting the lever to the indicating tube without attachment to the case.

260. HOSE COUPLING; Robert B. Lawton and W. H. Bliss, Newport, Rhode Island.

Claim—The thimbles, C D, being provided with the shoulder and ground seat or packing, and the thimble, D, provided with the groove with inclined sides and fitted within thimble, C, the above parts being used in connexion with the conical roller or rollers fitted in the screw caps.

261. FIRE-PLUGS; Joseph L. Lowry, Pittsburgh, Pennsylvania.

Claim—Making a single chamber serve the purpose of a cross-pipe, when each main leading into said chamber is furnished with its own stop-cock, and access is had to each stop-cock through said chamber for repairs, &c., thus making one chamber and one cover common to two, three, four, or more mains. Also, arranging the fire-plug immediately over the chamber, for the purpose of effecting a circulation of the water in the pipe between the main and the fire-plug, to prevent its freezing. Also, in combination with the valve and its wing, the hollow set-screws for wasting the water from the fire-plug when said valve is closed. Also, the removable gasket in the ends of the branches or bowls, so as to renew the seats for the valves when necessary, without disturbing the main or stop-cock, access to these gaskets being through the common chamber.

262. WATCH CASES; Louis Mabille, City of New York.

Claim—The construction of the case with the front plate fitted to the ring or frame, with a projecting rim and bevel all the way round, when combined with an internal cavity in the back to receive and contain the said plate, when removed from the front.

263. CURTAIN LOCK FOR CARRIAGES; Samuel Marshall, Wilmington, Delaware.

Claim—The employment of the two metal plates, in combination with the button and button-hole of the carriage and curtain, and with the spring fastening.

264. WATER GAUGE FOR STEAM BOILERS; Alexander Miller, Cleveland, Ohio.

Claim—Operating the valve of an alarm gauge to produce the alarm when necessary, by means of a cam or wiper on a valve stem, and a stationary inclined projection on the socket or tube, or its equivalent, the several parts being arranged and applied in combination with a float attached to the stem.

265. CORRUGATED IRON PAVEMENTS; James Montgomery, City of New York.

Claim—1st, The arrangement and combination of the unequal ribs or corrugations, for the purposes set forth. 2d, The described form and application of the laterally projecting spurs, for the purposes explained. 3d, The dovetailed groove shown, applied to metallic paving, and employed to retain within it concrete and other matter.

266. GRAIN SEPARATORS; Henry Montgomery and Simeon Howes, Silver Creek, New York.

Claim—The aperture, U, when situated immediately below the inclined board, and in combination therewith, for the purposes specified.

267. LOCKS; L. F. Munger, Rochester, New York.

Claim—The arrangement and combination of the knob with the tumblers and bolt, the said knob having studs out of the line with each other, one stud being in line with the bolt, and the other stud being in line with the tumblers, so that when the key is inserted, one of the studs shall pass by the tumbler, while the bolt is shot out by the other studs, and when the key is withdrawn and the knob reversed, the stud shall lift the tumblers and thus prevent the picking of the lock by the insertion of a key.

268. SCREW-PLATE; Putnam D. Nichols, Hartford, Connecticut.

Claim—The adjusting steady pins and set-screws, with the sliding plate attached to the regulating rod and screw, in combination with the method of adjusting and regulating the dies for operation.

269. BROOCHES, EAR-RINGS, &c.; Henry Oliver, Philadelphia, Pennsylvania.

Claim—Photographic or sun-pictures upon concave surfaces of glass, and backing them up with cement, in the manner specified.

270. BLIND FASTENING; Rufus Porter, Washington City, D. C.

Claim—The combination of the lateral catches with the elevated finger socket, the whole consisting of a single plate, which is so formed, that while the catch end thereof is horizontal, and constitutes right and left catches, and is connected to the bottom of the shutter, the opposite end is vertical, and is connected to the face

of the shutter at some distance above the bottom thereof, and constitutes a finger socket or hook near the hinged edge of the shutter, to be drawn back by a finger for the purpose of unfastening the shutter, when open, and closing the same.

271. LAMPS; Charles W. Richter, Sr., Madison, Georgia.

Claim—The combination of chamber and tubes with the non-conducting medium above plate. Also, the manner of moving the wick within the tube, in combination with the construction described.

272. STALLS FOR HORSES ON SHIPBOARD; Samuel Samuels, Brooklyn, New York.

Claim—Suspending a horse-box on board of a ship or other vessel, on pivots or centres, having their axes arranged transversely to the box, and parallel or thereabouts with the length of the vessel. Also, combining a series of two or more so-suspended boxes, as described.

273. SEAL-PRESSES; Joseph Saxton, Washington City, D. C.

Claim—1st, A sealing-press, operated by a lever, to which the stamp is attached by an adjustable joint, the whole being adapted to the purpose of sealing with fusible metal or alloy. 2d, The guard for retaining the excess of metal driven off from the seal, in the act of making the impression.

274. CURTAIN FIXTURES; Henry C. Spalding, Brooklyn, New York.

Claim—1st, The narrow rim, in combination with a roller having end play. 2d, The combination of the roller, flanch, and cord. 3d, The combination of the two hangers with the roller, the cord, and the rack, constructed as described.

275. TREADLE-STAND; Henry C. Spalding, Brooklyn, New York.

Claim—A self-sustaining skeleton treadle-frame, composed of sections secured together at right-angles, so that the frame is self-braced crosswise and lengthwise with the table which it supports.

276. APPARATUS FOR VENTILATING RAILROAD CARS; Robert Taylor, Reading, Pennsylvania.

Claim—The blowing cylinder hung to one of the trucks of the car, and operated from one of the axles by means of an eccentric, or other equivalent device, in combination with the flexible or self-accommodating inlet and discharge pipes, and the distributing pipes, arranged as set forth.

277. CHUCK FOR WATCHMAKERS' LATHES; G. H. Waldin, Burlington, Iowa.

Claim—The use of the cylindrical core or spindle, in connexion with the thimble for containing sealing-wax, or its equivalent.

278. CEMENTING ROOFS; J. L. G. Ward, Adrian, Michigan.

Claim—The covering of roofs of buildings by laying bricks, or tiles, or slabs of other material, in a bed of cement consisting of an alkaline silicate, and subsequently treating the surface of said cement with an acid which combines with the alkaline thereof, and leaves a surface of pure silica.

279. PESSARIES; Francis F. Wells, Texana, Texas.

Claim—The combination with the ring of the hinge-jointed and slotted standing supports and their stem, the hinged sliding support, the hinged arm, the collar, or its equivalent, and the plate.

280. APPARATUS FOR HANDLING HIDES; Charles Weston, Salem, Massachusetts.

Claim—The apparatus for keeping hides in motion while exposed to the action of the tanning liquid, the same consisting of parts constructed and arranged in relation to each other, as described.

281. FEEDING MECHANISM FOR SAWING MACHINES; Philip P. Weis and F. Schutte, Philadelphia, Pennsylvania.

Claim—The adjustable frame with its rollers, the pressure frame with its rollers, and the feeding screws, in combination.

282. KEY-BOLT FOR ATTACHING CARRIAGE THILLS; G. P. Wilhelm, Bridgeport, Pennsylvania.

Claim—The manner described of fastening shafts and poles to carriages by the arrangement of the bolt, spiral spring, and clips.

283. HARVESTERS, Walter A. Wood, Hoosick Falls, New York.

Claim—Connecting the bent bar to the axle, and allowing its other end free vertical motion between guides. Also, in combination with the bent bar for sustaining the finger end and cutter bars, the continuation of the finger bar and its attachment to the main frame, in the manner set forth.

284. MOWING MACHINES; Walter A. Wood, Hoosick Falls, New York.

Claim—Connecting the bent bar that carries the finger and cutter bar to the main frame by the spring plate, and to the axle by the loop, so that the finger bar may rise and fall independently of the wheel or main frame, or the main frame independently of the finger bar.

285. MACHINES FOR CORKING BOTTLES; Lewis L. Chichester, City of New York, Assignor to David L. Winthringham, Jersey City, New Jersey.

Claim—The toggles, frame, and bar, provided with the plungers, in connexion with an adjustable bottle-stand and bar provided with the tubes. Further, the particular manner of adjusting the bottle-stand, to wit: attaching the same to the frame by means of the lever, bar, arms, cross-bars, and plates, as described.

286. CATAMENIAL BANDAGES; Charles E. Clark, Assignor to self and George W. Clark, Boston, Massachusetts.

Claim—My improved manufacture of menstrual receiver, as made of two inflatable, water-proof, crescentic-shaped vessels, united by a water-proof system, and arranged together and with the septum, and provided with means of supplying them with air, and discharging it therefrom.

287. ELECTRO-MAGNETIC FIRE ALARM APPARATUS; Moses G. Farmer, Salem, Assignor to William F. Channing, Boston, Massachusetts.

Claim—The combination of two or more key-boards or fire alarm strikers with one or more electro-telegraphic alarm machines, in the same closed electric circuit or independent closed electric circuits, by means of a mechanism that will make and break a circuit, as described.

288. RAILROAD CAR SEATS AND COUCHES; Jonathan Good, Assignor to self and B. L. H. Dabbs, Philadelphia, Pennsylvania.

Claim—The arrangement and combination of the pivoted horizontally and vertically moving plate, curved ratchet plates, rack extension, and pinion, as described.

289. STRAW CUTTERS; Wm. Hinds, Assignor to Jerome Hinds, Little Falls, New York.

Claim—The arrangement of the cutters, c c, in combination with the cutter, n, constructed substantially as set forth.

290. Machine for Finishing Carboys; Lyman Hyde, Assignor to the Ellinville Glass Co., Ellinville, N. Y.

Claim—The shears, treadle, or its equivalent, mandrel, and furnace, placed within a suitable frame, and arranged as set forth.

291. Bed-bottom; A. W. Morse, Assignor to self and R. B. Robie, Eaton, New York.

Claim—The combination and arrangement of the rods, gear wheels, staples, pins, wires, or their equivalents, lever, ratchet roller, and pawl, for the purpose of giving the proper tension lengthways and sideways simultaneously.

292. Blacking; L. R. Rockwood, Assignor to J. L. Clough, Worcester, Massachusetts.

Claim—Edge blacking, when composed of the mentioned materials, in the proportion and manner described.

Additional Improvements.

1. Shingle Machines; James Crary, Middleport, Ohio; patented November 24, 1857; re-issued Sept. 28, 1858; additional dated February 1, 1859.

Claim—1st. The use of the bridles or guide, in combination with wrists of the shaving knives, and the conveying grooves and vertical slots, for the purpose of communicating to the shaving knives a combined drawing knife and approximating motion during the process of shaving the shingles. 2d, The use of the spring check-plate, in combination with the movable gate, to permit one only at a time of the shingle bolts to pass to the shaving knives, and prevent the bolt being drawn back on the retrocession of the feed-board. 3d, The use of a feed-board composed of elastic bars or fingers, each capable of a slight depression at its extremity, so as to accommodate the surfaces of the feed-board to any unevenness or twist in the shingle bolt.

2. Reciprocating Saws; Carlyle Whipple, Cleveland, Ohio; patented January 13, 1857; additional dated Feb. 1, 1859.

Claim—The adjustable ways and the friction wheels, arranged in the manner specified. Also, the vibrating beams, in combination with the ways and their dependent parts, constructed in the manner set forth.

3. Machine for Trimming the Edges of Paper-hangings; John Waugh, Elmira, New York; patented Oct. 5, 1858; additional dated February 15, 1859.

Claim—The framed ways moving in a curvilinear path on a centre at one angle of frame; the hand lever that operates on frame way, and the springs which keep the frame in position, in combination for the purposes set forth.

4. Spring Bed-bottoms; Henry F. Smith, Washington City, D. C.; patented October 6, 1857; additional dated February 22, 1859.

Claim—The supporting the fixed end of the longitudinal slats in spring bottom bedsteads, by means of longitudinal spring bars, so that the elasticity or yielding of both ends of the slats may be equalized.

Re-Issues.

1. Revolving Fire Arms; Josiah Ells, Pittsburgh, Penna.; patented April 25, 1854; re-issued Feb. 1, 1859.

Claim—1st, The combination of revolving breech and stationary barrel with a lock, so constructed, as that the trigger used to fire the pistol when drawn back raises the hammer to full cock, and there holds it; the revolving breech being at the same time rotated as far as to bring one of the chambers in a direct line with the bore of the barrel, and fastened in that position preparatory to firing the piece, in the manner described. 2d, The peculiar arrangement of the parts of my lock, whereby, as the trigger is drawn back to raise the hammer, the heel of the hammer on the point against which the main spring bears, is brought so nearly under the centre of motion of the hammer, that the force of the main-spring is counterbalanced by the pressure of the trigger on the toe of the hammer, and thus it will stand at full cock or may be fired at once, as may be desired. 3d, The use of the tubular extension on the fore part of the rotating breech, extending beyond and underneath the breech end of the stationary barrel, through which tubular extension the end of the spindle projects, and into which the spindle fits closely, for the purpose of preventing the fouling of the spindle by the residuum of the smoke in firing. 4th, The use of a collar at the end of the tubular extension, for the purpose of forming, in combination with the spindle, a locking connexion between the revolving breech and the stationary barrel, which is furnished with a corresponding recess for the reception of the collar. 5th, Forming that part of the spindle which enters the bore of the rotating breech of smaller diameter at the front extremity than at the end where it locks, but by reducing its diameter suddenly, so as to form a step or shoulder at one or more points within the rotating breech, having a bore of correspondingly diminished diameter for the double purpose of sustaining the recoil of the breech in firing, and of aiding to prevent the fouling of the spindle by presenting an obstruction to the passage of the smoke between the spindle and the surface of the bore of the rotating breech. 6th, Connecting and locking the barrel and breech to the lock-plate, by means of a bracket and spring extending in front of the lock-plate, in the manner described.

2. Vault Lights; Thaddeus Hyatt, City of New York; patented Sept. 19, 1854; re-issued February 1, 1859.

Claim—In the construction of illuminating vault covers, the open frame with its large aperture or apertures closed with glass, in combination with the protection grating.

3. Devices for Putting up Caustic Alkalies; George Thompson, East Tarentum, Pennsylvania; patented October 18, 1856; re-issued February 1, 1859.

Claim—The putting up of the caustic alkalies of soda and potassa in small quantities in air-tight wrappings, cases, or boxes, in the manner described, or its equivalent, for the purpose of introducing into general use for domestic and other purposes these articles, which, owing to their peculiar chemical properties, have not heretofore been susceptible of general use in small quantities.

4. Improved Steam Valve; George Rieseck, Pittsburgh, Pennsylvania; patented August 15, 1858; re-issued February 8, 1859.

Claim—1st, The valve, with a projecting hollow stem, which is reduced so that its ends present an area only equal, or nearly so, to the receiving ports in the face of the valve, in combination with the main steam chest or chamber, and an auxiliary steam chest or casing, furnished with a stuffing-box, and constructed so as to cover the whole of the valve, excepting the end of the stem or a portion of the back equal, or nearly equal, to the receiving ports in its face. 2d, In combination with the above, the peculiar manner specified of making the face of the valve with six ports, three for receiving and three for exhausting, said ports being arranged in such relation to each other that when the valve is applied to an oscillating engine, one receiving port always stands in line with the exhaust port, and that only four of the ports shall be in use when the engine is working, the other two being kept in reserve, so that by shifting the valve the engine will be instantaneously reversed under a full pressure of steam, without shutting off the steam between the engine and the boiler.

5. Machine for Threading Bolts; Wm. Sellers, Philadelphia, Pennsylvania; patented December 1, 1857; re-issued February 8, 1859.

Claim—The use of rotating dies, in combination with cams, or their equivalents, when both are so arranged as to be capable of revolving about a common centre at different velocities. for the purpose of opening and closing the dies. Also, the arrangement of cams with the open spaces between them, in combination with the die-box and dies, to facilitate the changing of the dies. Also, the mode of attaching the top-holder to the revolving die-box.

6. Boxes for Preserving Alkalies; George Thompson, East Tarentum, Pennsylvania; patented September 15, 1857; re-issued February 8, 1859.

Claim—The use of metallic boxes, constructed as described, and united with cement infusible at the degree of heat at which the caustic alkalies of soda and potassa remain fluid, for the purpose of putting up those caustic alkalies in small quantities.

7. Self-dumping Coal Bucket; John Wust, Philadelphia, Pennsylvania; patented July 13, 1858; re-issued February 8, 1859.

Claim—The combination of a bucket suspended by the handle at points below its centre of gravity, in combination with a self-acting detachable latch operated by the bucket touching the ground.

8. Lamps; Wm. W. Batchelder, City of New York; patented December 28, 1858; re-issued Feb. 8, 1859.

Claim—The arrangement of small tapers or wick tubes below and on both sides of the main or illuminating burner, in combination with a suitable cap, for the purpose of producing a more complete combination.

9. Machine for Folding Paper; S. T. Bacon, Boston, Assignee of E. N. Smith, Springfield, Massachusetts; patented May 17, 1858; re-issued February 8, 1859.

Claim—1st, The employment of adjustable points or register pins, or their equivalents, for the purpose of correctly presenting printed sheets to a paper-folding machine. 2d, The combination of a registering apparatus with a paper-folding machine. 3d, The combination of the register pins with the fingers, reciprocating carriage, and slotted bar. 4th, The combination of the slotted reciprocating carriage with the knife. 5th, The combination of the slotted reciprocating carriage with the first pair of folding rolls and knife. 6th, The combination of a folding knife, the edge of which is smooth, with one or more needle points projecting beyond and in a line with the edge thereof. 7th, Securing the needle point or points to the folding knife, in such a manner as that they shall have their main support back of the edge of said knife. 8th, So constructing paper-folding machines, as that the sheet while being folded shall occupy the same time, or nearly so, while passing from the position for receiving its first folds to that of the next and succeeding folds.

10. Machine for Folding Paper; Steuben T. Bacon, Boston, Mass., Assignee through mesne-assignment of John North, Middleton, Connecticut; patented April 15, 1856; re-issued July 27, 1858; re-re-issued February 8, 1859.

Claim—The use of a stationary folding-knife in a machine for folding printed sheets of paper, as described. Also, the combination of the folding-knives with the reciprocating carriage, as set forth. Also, giving the reciprocating carriage its proper motion by means of the crank and slotted connecting rod, in combination with the lever and link. Also, the device for raising and depressing the fingers, as shown. Also, the combination of the folding and carrying nippers with the stationary folding-knife. Also, releasing the sheet from the nippers, by means as described. Also, the circular knives for separating the sheets, when operated in the manner described. Also, the combination of the levers with double concentric rock-shafts. in the manner set forth. Also, the adjustable check and the mode of releasing its hold by the advance of the nippers, as set forth.

11. Machine for Folding Paper; Steuben T. Bacon, Boston. Assignee through mesne-assignment of Edward N. Smith, formerly of West Brookfield, Massachusetts; patented Nov. 27, 1849; re-issued January 7, 1851; re-re-issued February 8, 1859.

Claim—1st, Forcing the paper required to be folded between the first set of folding rolls by the knife, while the sheet is on the run. 2d, Forcing the paper from the first fold between two converging and continuously moving, flexible, yielding surfaces. 3d, Forcing the sheet of paper required to be folded upwards, for the purpose specified. 4th, The use of a cord or curved edge knife, for the purpose of forcing the sheet between folding rolls. 5th, The stop for determining the proper position of the sheet for delivering its second and succeeding folds. 6th, The combination of the carrying bands with a stop for regulating the sheet in proper position to receive its second and succeeding folds. 7th, The combination of the rolls and endless aprons or bands with the guides. 8th, So arranging the knives, aprons, and rolls, in a paper-folding machine, as that the sheet may receive two or more parallel folds in succession. 9th, So arranging the carrying and folding rolls in a paper-feeding machine, as that only a single series of endless aprons or bands shall remain in contact with the sheet, to conduct it while it is receiving more than one fold. 10th, The lightening pulleys and cords or bands hung upon the movable bar. for the purpose of giving proper direction to the sheet receiving the next fold. after having received a parallel fold. 11th, So conducting a machine for folding paper, as that one or more folds may be omitted at pleasure, and the folded sheet delivered outside of the frame and the working parts of the machine, by simply detaching the knives and removing the stops. 12th, Supporting the folding rolls in adjustable boxes, bearings, or frames, for the purpose of squaring them with the print or register of the sheet to be folded, and providing for the construction and expansion of the endless aprons or bands. 13th, The movable guides for the purpose of squaring the knives to correspond with the print or register of the sheet. 14th, Conveying motion to any pair of folding rolls, running at right-angles to the preceding pair by means of level gears placed at or near the centre of a roll, and between the aprons or bands, whereby the machine is rendered more simple and perfect in its operation. 15th, Pressing the folding sheet previous to its delivery, by passing it between two conveying and continuously moving yielding surfaces.

12. Distillation of Oils from Coal; David Alter and Samuel A. Hill, Freeport, Assignors to selves, John T. Johnson, of said Freeport, Wm. F. Johnson, George S. Selder, and John L. Russell, Pittsburgh, Pennsylvania; patented April 27, 1858; re-issued February 8, 1859.

Claim—The destructive distillation of coal, or other bituminous substances, for the obtaining the liquid products thereof, in the form of what is known as coal oils, by the process described, viz: combining the use of a low temperature not exceeding a low red heat, say about 850° Fah., with the use of retorts so constructed as to have a rotary, or other equivalent motion, for the purpose of agitating their contents.

13. Arrangement of Means for Working and Stopping Chain Cables; Thomas Brown, London, England; patented July 25, 1854; ante-dated April 20, 1847; re-issued February 15, 1859.

Claim—The faring and radial-flanched annular recess in the capstan for working a cable of any given size, or cables of several different sizes, the same being constructed in the manner set forth. Also, in combination with a capstan or windlass which is capable of working a chain cable when only a partial turn is taken, a set of removable rollers so arranged in relation to the capstan, the deck-pipes, and hawse-holes, that either a port

or starboard chain cable can be continuously hove in by means of said capstan and rollers, or can be directly run out of its locker without any previous overhauling. Also, the within-described arrangement of bow-stopper and after-stoppers, whereby more cable can gradually and controllably be given to a vessel whilst riding heavily at anchor. Also, the clearing guide, in combination with the annular recess of a capstan or windlass which is capable of working a chain cable where only a partial turn is taken, for the purpose and in the manner set forth.

14. Bandages; N. Jenson, Washington City, D. C.; patented December 14, 1858; re-issued February 15, 1859.

Claim—The extension spring-frame, arranged so that when the sides are closed by the pressure of the limbs, the rear of the frame will remain open, for the purpose as set forth. Also, the combination with the exterior frame, or when constructed and arranged as described.

15. Machine for Making Nuts, Washers, &c.; James Wood, Philadelphia, Pennsylvania, Assignee (through mesne-assignments) of Wm. Kenyon, Steubenville, Ohio; patented October 14, 1851; re-issued February 15, 1859.

Claim—1st, Making nuts for bolts by subjecting the blanks of which the nut is to be formed, at a welding heat, to compression between swages or dies in a close die or matrix, and punching the eye of the nut during the continuance of such pressure, for the purpose of welding up any imperfections in the iron, and giving a symmetrical shape and smooth finish to the nut, and of preventing any injury to the nut which it might suffer by the passage of the punch through it, if it were not thus restrained by the sides of the die-box, and forcibly compressed between the dies. 2d, The use of a die-box closed at the sides for surrounding the nut, and sustaining its sides while it is subjected to pressure. 3d, The combination of the compressing die with the die-box, for the compressing of the nut while it is sustained at the sides, and thus welding up any imperfections in the iron, and compacting its fibre so as to give strength as well as exterior finish and symmetry to the nut. 4th, The combination of the punch with the die-box and compressing dies, for the purpose of compressing, confining, and restraining the opposite forces of the nut during the passage of the punch through it; and thus preventing any injury to the nut during the process of punching, and also for the purpose of ensuring the making of the bore of the nut in the proper relative position to its upper and lower surfaces. 5th, The combination of the die-box, the compressing dies, and punch, for the purpose of making hot-pressed nuts at a single operation, by severing a blank from a bar of heated metal, compressing it into shape, and punching a hole or eye through it, while under compression, and delivering the finished nut from the machine. 6th, Arranging the compressing dies in relation to the punch, and regulating their relative motion, in such manner that any excess of iron in the blank shall be forced into the path of the punch in the compressing dies, thus securing the compression of the nut without risk or damge to the machine.

16. Railroad Car Springs; The Railroad Car Spring Co., Philadelphia, Pennsylvania, Assignee (through mesne-assignment) of Henry M. Paine, Worcester, Massachusetts; patented Oct. 27, 1857; re-issued February 15, 1859.

Claim—A railroad car spring consisting of a body of felt, or other fibrous material, condensed to a given density between two rigid plates, and prevented from expanding beyond that density by a bolt or bolts, substantially as set forth.

17. Extension Finger Rings; Samuel Friend and George Seiler, City of New York; patented Dec. 21, 1858; re-issued February 22, 1859.

Claim—A divided springing ring, constructed in the manner specified, whereby the springing of the ring permits the same to pass the joints.

Designs.

1. Stoves; Apollos Richmond, Brooklyn, New York; dated February 1, 1859.
2. Hot-air Furnace; Hiram Bissell, Hartford, Connecticut; dated February 15, 1859.
3. Gas Burners; Hiram B. Musgrave, Cincinnati, Ohio; dated February 15, 1859.
4. Carpets; Elimir J. Ney, Lowell, Mass., Assignor to the Lowell Manufac. Co.; dated February 15, 1859.
5. Carpets; Elimir J. Ney, Lowell, Mass., Assignor to the Lowell Manufac. Co.; dated February 15, 1859.
6. Stereoscope Cases; Wm. Loyd, Philadelphia, Pennsylvania; dated February 22, 1859.

MARCH 1.

1. Rotary Engines; Abraham Andrews, Bernville, Pennsylvania.

Claim—1st, The mortised valve and its connexion with the rod, as operated by the cam wheel, in combination with the said axle or shaft. 2d, The arrangement of the plungers with their side rollers and cam wheels, in combination with the axle or shaft, as described.

2. Brick Moulds; Joel W. Andrews, Norristown, Pennsylvania.

Claim—The arrangement of the pivoted handles, links, and bars, connected to movable bottoms, in the manner set forth.

3. Invalids Table; Jonathan M. Allen, Worcester, Massachusetts.

Claim—The combination of the revolving table, bed, or leaf, with the column, made adjustable, and capable of being fastened in position, as described.

4. Seed Planters; John C. Baker, Mechanicsburgh, Ohio.

Claim—The arrangement of the wheels, cams, lever, friction roller, and disc, constructed as set forth.

5. Machine for Cross-cut Sawing; Joseph Battin, Newark, New Jersey.

Claim—The driving-pulley of the saw mandrel in connexion with the pulleys, one or both, placed in the carriage, and the driving belt, combined as set forth.

6. Seed Planters; J. C. Benthall, Oakland, Texas.

Claim—The arrangement of the rock shaft, connecting rod, arm, spring, and pendant, for the purpose of enabling the seed-distributing device to be actuated by the leg of the operator.

7. Amalgamating Riffles; J. S. Briggs, Michigan Bluffs, California.

Claim—The cup punch, as constructed, for saturating wood with quicksilver.

8. Harness Attachment for Supporting Driving Lines; T. D. Brown, Montville, Ohio.

Claim—An attachment or line-supporter, to be placed on a horse's rump, by securing it to the harness in

the manner shown, or in any equivalent way, said attachment consisting of the adjustable strap, pin and clasp, cross-piece, adjustable standard, and arms, arranged as described.

9. Tram-staffs for Facing Mill-stones; Thomas Brown, Kenwood, New York.

Claim—The arrangement and combination of the supporting ring, arranged to rest or lie on the face of the stone, with the triangular frame and adjustable staff, by which mill-stones may be faced more accurately and with greater facility, either plain or with suitable concavity or bosom.

10. Harvesters; Charles Brownlich, Buffalo, New York.

Claim—The pivoted shoe connected to the rear end of the frame of the machine, by means of the bolt upon which it oscillates, in combination with the levers, as set forth.

11. Corn Harvesters; J. L. Chapman, Kimmandy, Illinois.

Claim—1st, The combination with a corn harvester frame, having V-shaped conductors, of sickle-shaped revolving cutters, partially serrated and partially plain-edged stationary cutters, upper and lower horizontal spring guides, and endless apron, arranged as set forth. 2d, The partially serrated and partially plain-edged stationary cutters, of the form described, in combination with the rotary cutters, as set forth.

12. Harvesters; George E. Chenoweth, Baltimore, Maryland.

Claim—A polygonal step having more than four sides, in combination with a standard or post, the lower of which corresponds in figure with the interior of said step, as described.

13. Bee-hives; George H. Clarke, East Washington, New Hampshire.

Claim—The construction and arrangement of the bars, the same consisting in making each of them with a salient, angular, or sharp, or nearly sharp, lower edge or surface, extending lengthwise of it and downward from it, the several bars being arranged at convenient distances for the bees to pass between them or upward into the chambers, as described.

14. Rotary Shingle Machine; Anson Alcott, Lakeport. New York.

Claim—The combination of guides, springs, connected therewith, slide, reciprocated from the movement of the cutter wheel, and the shingle cutter, arranged as described.

15. Spice and Coffee Mills; Charles R. Edwards, Suspension Bridge, New York.

Claim—The burr provided with the flanch and handle cast in one piece, in connexion with the concave grinder having the axle cast upon the same, arranged as set forth.

16. Hemming Guides for Sewing Machines; Wm. Clemmons, Nicholasville, Kentucky.

Claim—The combination with the hemming attachment of the spring placed in the groove under the pressure pad, as described.

17. Sausage-stuffer; Henry L. DeZeng, Geneva, New York.

Claim—The construction and arrangement of the parts, A D F, substantially in the manner set forth.

18. Washing Machine; L. A. Dole, Salem, Ohio.

Claim—1st, The arrangement of two winged rollers with a flexible adjustable apron clothes bed, in the particular manner specified. 2d, The use of a flexible apron clothes bed, when made adjustable, as set forth. 3d, The use of an adjustable swinging, self-opening, and self-closing rubber or leather packed valve or partition, in combination with the adjustable flexible apron bed, as set forth.

19. Seeding Machine; Carloss and Darwin E. Eggelston, Beloit, Wisconsin.

Claim—1st, The arrangement of the rotating shaft in two or more parts, driving-pulleys, pulley encasement, seed pockets, stationary perforated bottom piece, adjustable slide, and cut-offs. 2d, In combination with the above, the shipper, and adjustable slide bar or gauge, when the shipper is pivoted to the gauge, to operate as specified.

20. Machine for Blowing Uniform Currents of Air; Jonathan Griffin, Harpersfield, New York.

Claim—1st, Operating the feeders alternately by means of the cross arms with the rollers traversing the curvilinear elevating ways. 2d, Regulating the quantity of air admitted into the air chamber, according to the quantity required, by means of the check wire and sliding arm or brake operating on the balance wheel, arranged as described. 3d, Connecting the top and bottom of the air chamber by means of india rubber straps, or other springs, when used in combination with the mechanism for driving the feeders to overcome and stop the operation of the motive power when the chamber is full, and thereby steady the current of air, and prevent too great strain on the chamber.

21. Lamps; Elias J. Hale and Charles H. Chandler, Foxcroft, Maine.

Claim—Our improved rack wick-holder, as constructed and applied to the wick and the spur-wheel, so that the teeth of the latter may pass through the rack, and act on both the rack and the wick at one and the same time. Also, the flanch or collar, for the purpose of equalizing the aerial current as it strikes the flame of the wick.

22. Applications for Restoring the Hair; Beverly Harris, New Orleans, Louisiana.

I do not claim the use of castor oil, bay rum, alcohol, or quinine for hair tonics, as I am aware these ingredients have heretofore been used for this purpose.

Claim—The use of bitter apple and gunpowder, in combination with the before stated ingredients, when used in substantially the same proportion as set forth, and for the purpose of hair tonics.

23. Revolving Fire Arms; Wm. C. Haynes, Melrose, Texas.

Claim—Combining with a stationary barrel having several tubes or chambers for shot, a rotating cylinder, having groups of chambers, each group of chambers being so arranged as to correspond with the chambers or tubes in the barrel, and also so arranged in connexion with a single cone, or its equivalent, to each group, that the explosion of the cap, or its equivalent, shall fire the whole group to which the cone upon which it was exploded belongs, as set forth.

24. Manufacture of Tin-foil; Wm. W. Huse, Brooklyn, New York.

Claim—The production of tin-foil having but an outer casing of tin, or its alloy, covering a filling of lead or its alloy, by the reduction by pressure of a cylindrical bolt of the latter metal or alloy, which has been previously coated by dipping with the former metal or alloy, and the repetition of the dipping at suitable stages of the reducing process, as described.

25. Apparatus for Distilling; Peter Kessler, Belleville, Illinois.

Claim—The employment of the stills and cooler, in combination with the vessels, when said vessels are arranged so as to have a tapering space and an intermediate circulating passage between them, as set forth.

26. Harvesters; David P. Kinyon, Raritan, New Jersey.

Claim—The arrangement of the frame which supports the driving wheel, so that the adjustment of the relative position of the driving wheel and cutter is effected by the leverage of the inner frame, in the manner described.

27. Apparatus for Heating Buildings; Lewis W. Leeds, City of New York.

Claim—Combining the uses of steam and water for heating buildings, by means of one or more water vessels combined with a separate steam boiler, and applied in such manner that the steam from the said boiler is employed only to heat the water in the said water vessel or vessels, and that the said water vessel or vessels constitute the heater or heaters of the air, as described.

28. Horse Rakes; F. C. Kneeland, Hartford, Wisconsin.

Claim—The arrangement and combination of the shaft pivoted within the frame, and provided with the treadle, arms, and bar, with the frame, when the latter is pivoted to the axle, as described.

29. Fastening Bands on Bales and Packages; Hazard Knowles, City of New York.

Claim—The method of fastening the ends of a metallic strap or hoop, by passing each end of the strap or hoop through a slot in a metal plate, one edge of which slot is formed with a bent lip on the outer face, bending the end of the strap or hoop over and outside of such lip, and hammering or clenching down both the end of the strap and the lip, that the strap or hoop may be clasped or held irrespective of the body which is to be strapped or hooped.

30. Boiler for Generating Steam; Joseph G. E. Larned, Brooklyn, New York.

Claim—1st, The substitution for the parallel or concentric sheets of boiler plate ordinarily used to form the fire-box of steam boilers, of a continuous row or rows of upright water tubes, set side by side, to connect the steam drum or water space above the fire with a water bottom below it, in such way as to form by themselves a water jacket; said tubes being inserted in the sheet above and below by means of necks, or smaller continuations, the diameter of which is so much less than that of the tubes as to leave a sufficient thickness of metal between adjacent perforations of the sheet, when the tubes are placed near enough together to answer the purpose of enclosure; expressly disclaiming, however, the use of such necks, or smaller continuations, in themselves considered, or for any other purpose, or in any other arrangement than that set forth. 2d, The combination of rows of water tubes, set side by side, to enclose the furnace, with tubes arranged annularly to give increased surface, without reference to the particular method of inserting the enclosing or arranging the annular tubes. 3d, The method of inserting the innermost of the tubes, when arranged in pairs, one within the other, so that they may be taken out and put back at pleasure, and without injury, by means of a screw or lock nut joint at one end, and a combined screw and expansion joint at the other.

31. Pumps; Edwin Lawrence and Robert Safley, 2d, Waterford, New York.

Claim—A circular reciprocating double-acting pump, that will both raise and propel water on both sides of the cylinder at one and the same time, and by the same motion of the arms or piston, as set forth.

32. Apple-cutting and Coring Machine; A. F. Ledbetter, Westminster, North Carolina.

Claim—The cutter attached to the reciprocating frame, in connexion with the annular opening in the bench, and with or without the spout, the parts being arranged as set forth.

33. Machine for Crozing and Chamfering Barrels; Hiram Littlejohn, Troy, New York.

Claim—Crozing and chamfering barrels, kegs, or casks, by turning the bulging cylinders of staves in upon or against suitable rests or supports, and around rotating cutters, which turn in opposite directions, and describe circles of less diameter than the inside of the ends of the cylinders of staves, the cutters and the rests being so arranged together, and one or both of them made movable, that the cylinders of staves can be conveniently applied to and removed from the rests and cutters, substantially as set forth.

34. Horse Rakes; William H. Long, Lancaster, Pennsylvania.

Claim—The arrangement of lever, shifting lever plate, and tooth beam, with axle and regulating screw, constructed as set forth.

35. Paper made from Reeds; Henry Lowe, Belleville, New Jersey.

I do not limit myself to the described process of making reed paper, or to any other process equivalent thereto. But I

Claim—The use of reed fibre in making paper, said fibre being prepared from the reeds called Arundinaria, Macrosperma of Michaux, and employed in the manufacture of paper, as set forth.

36. Pumps; John M. Lunquest, Griffin, Georgia.

Claim—The arrangement of cylinders, piston heads, ball valves, air chamber, and valves, said valves being kept in position by proximity to each other and the sides of the chamber, in the manner specified.

37. Crossings for Railroads; Samuel Macferren and Strickland Kneass, Philadelphia, Pennsylvania.

Claim—The employment of inclined surfaces at the point where two rails intersect each other, when the said surfaces are arranged in respect to the intersecting rails, as set forth.

38. Carriage Spring; Edward Maynard, Brooklyn, New York.

Claim—Attaching the returned ends of the spring directly to each other by means of the shackle, as specified.

39. Treatment of Caoutchouc; Morris Mattson, Boston, Massachusetts.

Claim—My improved india rubber composition or manufacture, as made in manner substantially as specified, without any of the oxide of lead, but of caoutchouc, sulphur, and one or more others, or an earth or earths containing one or more finely divided oxides of iron, and employed in a quantity much greater than necessary for simply affording color to the compound, the quantity being essentially in the proportions as stated, or such as will afford the economical and useful results as explained.

40. Roofing Cement; Oscar S. Oaks, South Rutland, New York.

Claim—The employment, in combination with the other substances specified, of the alkaline solution of shellac and the sulphate of baryta, the whole being compounded substantially as and in about the proportions set forth.

41. Motive Power; John G. Mitchell, Collington, Maryland.

Claim—The application of weights in connexion with the shaft and treadle, so that when disconnected from the treadle the weights are in equilibrio, and subject to be moved by any agency applied to either weight at the end of the lever or arms, so as to produce motion in the machinery at the termination of the machine proper, arranged in the manner described.

42. Construction of Steam Vessels; James Montgomery, City of New York.

Claim—1st, Constructing the hulls of vessels with one or more cavities in the bottom, commencing at or near the stern, increasing in capacity sternwards, as set forth. 2d, Constructing the bottoms of vessels with corrugations extending from stem to stern, which give strength to the hull, and a portion of which form the cavity or cavities referred to. 3d, The described combination, an inclined screw propeller with a hull. 4th, Two or more rudders, operating in combination with the described longitudinal cavities in a ship's bottom.

43. Potato Diggers; Robert Niven, Yates, New York.

Claim—The combination and arrangement of the shoe or share, endless screen, and pendant or supplementary riddle, with the frame and side plates, sinuous slots, and slotted levers, operating conjointly as set forth.

44. Machine for Printing the Address on Newspapers, &c.; A. H. Nordyke, Richmond, Indiana.

Claim—1st, The arrangement of an endless conveyor for feeding the envelopes under the forms to receive the impressions, and delivering the same after printing, in combination with a driving set wheel. 2d, The two inclined tracks, K and L, arranged one above the other, in such manner that the forms may be carried up the inclined track, K, and delivered upon the inclined track, L, and brought by their own gravity down said track, and under the pressure rollers, and from thence to the point of discharge. 3d, The arrangement and combination of endless band, catch, and jointed track, K, for taking the forms from the end of said track, and delivering them upon the lower track, L, arranged as described.

45. Governor for Steam Engines; G. T. Parry and H. W. Evans, Philadelphia, Pennsylvania.

Claim—One or more revolving weighted spring levers, in combination with the sleeve and the connexions described, or their equivalents, between the said sleeve and levers, when the latter are hung to pins placed at such a distance from the centre round which they revolve, that the weights at the end of the levers shall move in the arc of a circle, contained within, or partially within, the circle described by the said pins, as set forth.

46. Churn; Andrew Patterson, Birmingham, Pennsylvania.

Claim—The combination of the chamber, a, with the chamber, b, when said chamber, b, serves the double purpose of a lid or covering for the cream in chamber, a, and a frame for the dash-wheel, driving-wheel, and crank, as described.

47. Ships' Propeller; J. K. Peters, City of New York.

Claim—The arrangement and combination of stops, arm, and blade (more than one blade with the stops being combined with the arm, when desired), as described.

48. Lock; Daniel Powers, Philadelphia, Pennsylvania.

Claim—The independent movable, expanding, and contracting fence, or its equivalent, as set forth. Also, the union of the upper and lower halves thereof, as specified.

49. Centre-board; Noah Pratt, Nicholson, Pennsylvania.

Claim—Applying the centre-board and appliances for operating the same in a movable box or curb which is so fitted into a well-hole, or a stationary curb built into the vessel, as to be capable of being lifted out of said well-hole or curb with the centre-board and all its appliances, as described.

50. Harvesters; Daniel Ranck, Intercourse, Pennsylvania.

Claim—The combination of the inclined planes and springs, crank and connecting rod, spindle or pivot, sliding rake head, and curved supports, when these several parts are arranged in the manner described.

51. Ploughs; Isaac Rulofson, Penn Yan, New York.

Claim—The arrangement of beam, standard, landside strip, share, mould-board, and piece, constructed and united as set forth.

52. Screw Propeller; G. E. Safford, City of New York.

Claim—The hub made in two discs, with spiral or inclined slots to receive the floats, when the floats are removably secured to the hub, in the manner described.

53. Automatic Bell-ringer; E. N. Scherr, Philadelphia, Pennsylvania.

Claim—The manner of automatically producing music from bells by the employment of adjustable pins in the barrel, actuated by clock-work, or other motive power, and giving motion to the hammers, in any manner equivalent to that described.

54. Constructing Wharves; Alexander Stephens, Baltimore, Maryland.

Claim—Brace piles driven at a suitable angle, and having their heads so drawn back as to secure a purchase from the footing of the pile, when combined with vertical piles and capping logs, as described.

55. Smut Machine; D. P. Shaw and F. C. Brown, Rochester, Indiana.

Claim—The arrangement of the blast spouts with the scouring device enclosed within the cylinder, and the fan-box in connexion with the tubes, whereby the grain is subjected to a continual blast during the whole of its passage through the machine, to wit: prior to its advent into the cylinder while being acted upon by the scourer and after it leaves the scourer, as described.

56. Washing Machine; Wm. N. Slason, South Reading, Massachusetts..

Claim—The arrangement and combination of the squeeze gratings or boards with the reciprocating dasher or washer, or rinsing chamber. Also, the application of the separate soap-chamber to the wash or rinsing chamber, in manner set forth. Also, the arrangement of the windlass with reference to the box and brake, as specified.

57. Water-wheels; Jacob Stear, Smicksburg, Pennsylvania.

Claim—The combination of the cylinder, inclined ribs, and disc, with its buckets, constructed as described.

58. Hearth for Working and Refining Iron; R. D. Stewart and John Christopher, Digonier, and Ross Forward, Somerset, Pennsylvania.

We do not wish to be understood as claiming the steam chamber and perforated hearth described, of any particular shape or dimensions as applied in the various ways set forth, but claim its application in any shape or size required for the purpose mentioned. What we specifically

Claim—Is the steam chamber and perforated hearth, as described, for the uses set forth.

59. Apparatus for Slaughtering Hogs; G. W. B. Story, Carlisle, Pennsylvania.

Claim—The arrangement of the vertical shafts, lever, and bar, with the vertical rotating shaft, and the rectangular frame, constructed as set forth.

60. Mashing; N. G. Thorn, Dayton, Ohio.

Claim—1st, The perforations in the pipes attached to the hollow arms, or any analogous device, by which water, steam, or air is admitted into the mash-tub, in such manner as to distribute it equally, or nearly so, to all parts of the mash. 2d, The spiral agitators, when attached to any revolving machinery, for the purpose set forth. 3d, The surface agitators of whatever form, when attached to revolving tubes, for the purpose set forth. 4th, The use of a self-packing joint applied to mash-tubs, when used for the purpose set forth, in whatever form it may be constructed. 5th, The combination of the surface agitators with a stationary or revolving blast.

61. Corn Planters; Amos G. and A. J. Thompson, Belleville, Ohio.

Claim—The arrangement of spiral springs, in combination with cross-bar and straps, for regulating the movement of the plungers, as specified.

62. Machine for Scouring and Hulling Grain; Joseph N. Treadwell, Reading, Connecticut.

Claim—In combination with a bed-stone and runner for scouring and hulling grain, the grooves and rasping plates skirting said grooves, said parts being arranged and operating together, as set forth.

63. Sugar Cane Mills; A. Van Trump, Lancaster, Ohio.

Claim—The combination in a sugar cane mill of two or more intermediate small feed rollers, with four or more large crushing rollers, as set forth.

64. Skates; M. Vandenburg, Newark, New Jersey, and F. Berry, Oswego, New York.

Claim—1st, An elastic front to confine the foot to the skate. 2d, Rendering the foot-board adjustable to feet of various widths by constructing it in sections.

65. Piano-fortes; George Vogt, Philadelphia, Pennsylvania.

Claim—The employment of the described rest and bridge, either separately or combined, when the same are constructed and operating in manner set forth.

66. Water Metre; A. W. Von Schmidt, San Francisco, California.

Claim—Combining with the propeller, the radial partitions or feathers and the re-acting shutes, said feathers and shutes being arranged as set forth.

67. Harvesters; Russel Warner, Brattleboro', Vermont.

Claim—1st, The circular cutters attached to bars at the lower ends of rotating shafts, and having an independent rotating motion given them by means of the gearing. 2d, The combination of the cutters, plates, and shafts, with or without the sharpeners, arranged to operate as set forth.

68. Horse Rakes; Wm. H. White, Garretsville, New York.

Claim—The employment of the two levers when crossed diagonally and pivoted together at d, in combination with the turning rake head, frame, and seat, as set forth.

69. Ploughs; J. M. Whitney, Bolton, Massachusetts.

Claim—The arrangement of the hinged arms, adjustable brace, and standard, with the wheel and plough beam, constructed as described.

70. Cultivators; J. M. Whitney, Bolton, Massachusetts.

Claim—The arrangement of the teeth, adjustable mould-boards, frames, and cross-beam, with the branched swivel bar and frame, constructed as described.

71. Gauge Cock; John E. Wooten, Philadelphia, Pennsylvania.

Claim—The arrangement of the tube, in combination with the cam, rod, and valve, in the manner set forth.

72. Valve Gear; A. A. Wood, City of New York.

Claim—The combinations of the links attached to the eccentric rod, and arranged with adjusting gear, as described.

73. Manufacture of Steel; F. A. Lohage, Unna, Prussia, Assignor to E. L. Benzon, Boston, Massachusetts.

Claim—The art of manufacturing steel of any desired temper, or hardened according to the various purposes or uses for which the steel may be required, by arresting the decarbonization of the mass of metal in the furnaces at certain points or stages thereof, ascertained and recognised by means of certain phenomena, or external indications manifested by the material, substantially as described.

74. Making Bolts and Rivets; J. R. Bassett, Assignor to self and A. E. Bateman, Cincinnati, Ohio.

Claim—The die, substantially as described.

75. Cast Iron Fence Post; P. Stewart, Assignor to Auchambaugh Brothers, New Lebanon, New York.

Claim—A cast iron fence post, constructed with flanches to protect the ends of the fence rails against being split as well as against moisture, in the manner described.

76. Precipitated Sulphur; D. E. Paynter, Assignor to self and I. M. Bissell, Philadelphia, Pennsylvania.

Claim—Manufacturing precipitated sulphur from the ashes resulting from the combustion of gypsum and coal dust, in the manner described.

77. Tempering Steel Springs; James Jenkinson, Assignor to self and F. Mandel, Williamsburgh, N. Y.

Claim—Arranging the wires in such a manner that by tying one end of each of the same to one of the arms of the wheel on which the coil is formed, and by extending the ends so tied down to the hub of the wheel the loose ends of the wire serve to fasten the several rings of the coil, as described.

78. Measuring Faucet; W. W. Hollman, Eddyville, Kentucky.

Claim—1st, In combination with a faucet-piece, having an induction and eduction pipe, a receiving and variable chamber, so constructed and arranged, that by partially rotating it within the said faucet-piece, the liquid will be alternately received and discharged through a port or ports. 2d, Making the rod polygonal, when used in combination with the variable measuring chamber and its piston, as described.

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79. WATER-WHEEL; Abraham Andrews, Bernville, Pennsylvania.

Claim—The curved concave buckets, in combination with the spiral chamber beneath, as described.

80. CAR-COUPLER; J. B. Atwater, Berlin, Wisconsin.

Claim—The arrangement of the falling gate provided with projection loosely hinged down, turned over at its top, and provided with inclined projection, adjustable piece, pin, lever, and catch, combined in the manner specified.

81. REGISTER FOR SHEETS OF PAPER; S. T. Bacon, Boston, Massachusetts.

Claim—Punching or cutting holes in sheets of paper, for the purpose of securing a more perfect and rapid register in printing and paper-folding machines.

82. DUMPING WAGON; Theodore Bailey, Friendship, Virginia.

Claim—1st, A wagon which dumps itself by the approximation of the wheels. 2d, The combination of a spring catch with the divided reach, as set forth.

83. CONNECTING HUBS AND AXLES OF VEHICLES; David Beard, Shippensburg, Pennsylvania.

Claim—1st, The peculiar manner of effecting a combination of the hub, short auxiliary axles, and intermediate stationary axle, whereby internal auxiliary bearings for the short axle, and an external main bearing for the hub are provided. 2d, Making the end of the main axle convex, and the main bearing in the inner end of the hub concave.

84. YOKES OF SHIPS RUDDER POSTS: W. Beers, Milan, Ohio.

Claim—The construction of a divided yoke for rudder posts, in combination with the employment of a guard of india rubber, or other elastic packing, between the yoke and the post, in order to prevent injury to the rudder post, and also to facilitate the repair of damages produced by the common yoke.

85. SHIPS STEERING APPARATUS; W. Beers, Milan, Ohio.

Claim—1st, The slotted arm or arms, constructed in the manner set forth. 2d, The elastic friction collar or collars, and the elastic guard or guards, in combination with the above described steering machine, for preventing concussion and friction. 3d, The friction rollers, in combination with the screw-nut, for preventing the nut from binding upon the screw.

86. TREATMENT OF VULCANIZED RUBBER; H. W. Beins, City of New York.

Claim—The process described of cementing vulcanized india rubber to, and covering it with, a new layer or unvulcanized india rubber composition, in the manner set forth.

87. ATTACHMENT TO RULING MACHINES; J. B. Blair, Philadelphia, Pennsylvania.

Claim—The application of one or more magnets (electro-magnets) to any ruling machine for ruling paper, in such manner that the magnets shall, either directly or indirectly, be made to control the operations of the pens, through the agency of the paper, in breaking, closing, or changing the circuit of electricity.

88. GRAIN SEPARATORS; J. L. Booth, City of New York.

Claim—A grain separator composed of a box, belt, plates, hopper, pulleys, and otherwise constructed as described.

89. FISH-TRAPS; Daniel Bowman, Tampico, Tennessee.

Claim—Making the dams to incline towards each other and up stream, so as to shelve over and make a dark recess to induce the fish to run towards the shute and trap, when the water is clear as well as when it is muddy. Also, the cover of the shute, for the purpose of shading the water and making it dark, so that the fish will be induced to enter the shute and trap.

90. TRUNKS; Henry Clifton, Buffalo, New York.

Claim—In combination with a trunk made up of a series of drawers, such as described, the hinged plates for holding and locking said drawers to the frame of the trunk, through the intervention of the lid and its lock.

91. HORSE RAKES; I. C. Burget, Davenport Centre, New York.

Claim—1st, The arrangement of the treadles hung to the frame, in combination with the rake-bar and yoke, for raising one end of the rake without disturbing the other. 2d, The combination of the springs with the arm and catch-plate, for holding the rake-bar in position, and at the same time to allow it to yield bodily to any obstruction there may be upon the ground.

92. SEWING MACHINES; J. H. Cooper, Philadelphia, Pennsylvania.

Claim—The combination of the shuttle-holder, arm, L, crank, and arm, M, or its equivalent, when the said holder is attached to, or forms a part of, the arm, L, when the latter is carried by the crank, and when the whole of the parts are arranged for joint action, as set forth.

93. ASHES SIFTERS; Allen Cummings, City of New York.

Claim—The combination of the pyramidal or conical-formed distributor interposed between the entrance and the sieve, the latter being of similar form inverted, these being arranged in relation to each other and to the diaphragm and receptacles.

94. CULTIVATORS; C. H. Dawson, Jacksonville, Illinois.

Claim—The plough-beams, arranged as shown, in connexion with the roller applied to the machine, as set forth.

[A series of ploughs are attached to an adjustable frame, which is connected to an axle, and so arranged that they may be placed higher or lower as desired, and the device is capable of being used as a gang or subsoil plough. In connexion with the ploughs, a roller is placed that crushes and rolls down weeds before them, thus facilitating their work.]

95. LAMPS; M. A. Deitz, Brooklyn, New York; ante-dated September 8, 1858.

Claim—The arrangement of an air chamber in the top of a lamp having a flat wick, when said lamp is provided with a cone or deflector for feeding air to the flame, and the air chamber, with a series of holes for the admission of fresh air, and openings for its passage upwards along the sides of the wick tube, or their or either of their equivalents.

96. MACHINES FOR FOLDING AND REGISTERING PAPER; A. F. Endress, City of New York.

Claim—The arrangement of a series of folding knives at right-angles to one another in the same sliding

frame. Also, arranging the sliding frame in such a manner that it operates a registering apparatus by means of a lever, as specified.

97. ROTARY PUMPS; J. L. Fagan, Anaqua, Texas.

Claim—The combination of the rotating hollow shaft provided with a valve, the cylinder, A, attached to said shaft, perforated at a, and having the adjustable or hinged valve or piston, secured within A, and the stationary stop or cut-off attached to the bed-plate, and fitted within the cylinder.

98. BALLOONS; J. P. Gage, City of New York.

Claim—Operating upon the air by the instrumentality of the balloon itself, constructed in a diamond or lozenge-shaped figure, or any other substantially similar figure, presenting a flat surface to the air, arranged and adjusted with the car suspended from the lowest central point of the balloon by a rod with link joints, or their equivalents, and operated by the fore-and-aft and side halyards, in the manner described. Also, the manner of arranging and adjusting a diamond-shaped flat frame or surface (or any similar shape) to a spherical balloon, with the car suspended underneath, as shown.

99. COTTON SEED PLANTERS; C. C. Garrett, Spring Hill, Alabama.

Claim—In combination with the wheel and brushes, the adjustable plates, arranged as specified.

[In this invention a rotating toothed wheel is employed in connexion with stationary stripping brushes, the wheels and brushes being placed in the bottom of a seed-box which is provided with adjustable plates, the parts being arranged to operate, so that cotton seed may be planted in the same state that they are discharged from the gin, and the discharge of seed regulated as may be desired.]

100. OPERATING PUPPET VALVES OF STEAM ENGINES; Samuel Gaty and Omos Howe, St. Louis, Missouri.

Claim—1st, The steam lifters, J J′, exhaust lifters, K K′, and puppet heads, B B′, with their respective faces, for the purpose of operating steam and exhaust valves and puppet valve steam engines. 2d, The lifter, J, in combination with the jointed lifting piece, T, puppet head, B, and graduated cut-off ring or sector, for the purpose of producing a variable expansion motion, self-regulating or otherwise. 3d, The relative adjustment of the cut-off ring, for the purpose of admitting steam in equal quantities in each end of the steam cylinder, in the manner described.

101. STEAM GAUGE; W. Y. Gill, Henderson, Kentucky.

Claim—1st, Constructing a steam gauge, in which a piston acts in opposition to a spring, in such a manner that the lower portion of the same acts as an alarm by means of openings, and so that the indication may be marked on one or more sides of the upper portion of the stem. 2d, Constructing the portion of the piston of a smaller diameter than the lower and upper portion, and arranging the spring on the portion, above the lower packed portion and below the indicating portion.

102. BURNING FLUIDS; Jonathan Griffin, Stanford, New York.

Claim—The burning fluids, formed in the manner and of the materials set forth.

103. COTTON HARVESTERS; John Griffin, Louisville, Kentucky.

Claim—The cylinder, one or more, provided with a perforated plate, flexible tube or tubes, and made to communicate with the steam boiler by means of the tubes, as set forth.

["Picking cotton by steam!" is indeed a novel idea. The inventor connects a flexible tube with a cylinder provided with a perforated plate and connected with a steam boiler, so that a vacuum may be produced within the cylinder, and the cotton picked from the bolls on the standing stalks by atmospheric pressure, the tubes being presented to the cotton by suitable attendants. In carrying out this invention the inventor designs to have the cylinder above mentioned connected with the boiler of a traction engine, in order to facilitate the transporting of the machine and the moving of it from place to place, or from row to row, in the course of its operations. He also intends to use several cylinders and a plurality of tubes, so that many hands may be employed, and a number of rows of cotton be harvested simultaneously.]

104. METHOD OF OPERATING FARM GATES BY APPROACHING VEHICLES; A. J. Hamilton, Kewaunee, Illinois.

Claim—1st, In combination with the two road levers, the rigid actuating rods, crank levers, latch rod, swivel bar, and latches. 2d, In combination with the road levers, the elevations or hedges, as described.

105. CULTIVATORS; Theodore Heermans, Mitchelville, Tennessee.

Claim—1st, The screw-tapped shoulder or flanch and screw shank of the cultivator teeth, in combination with the screw nut having a series of auxiliary screws, in the manner described. 2d, In combination with the above, the specified arrangement of large and small cultivator teeth.

106. COTTON SCRAPERS; John Henderson, Bluff Springs, Mississippi.

Claim—The forked bar and brace bar, in combination with the beam and wings of a double-winged cotton scraper, when constructed in the manner set forth.

107. MACHINE FOR PRINTING RAILROAD AND OTHER TICKETS; R. M. Hoe, City of New York.

Claim—1st, The peculiar mechanism, or its equivalent, for moving the registering discs on their axes at the proper times, by which means the tickets are numbered consecutively. 2d, Giving such a movement to the registering discs, as will cause said discs to approach, press against, and travel with the impression cylinder, thus giving an impression to the roll of paper, then recede to change the figures of the discs, and allow the inking roller to perform and then again to approach the impression cylinder, and so on as before. 3d, The adjustment of any derangement of the registering discs caused by slip, jar of the machine, or other cause, by means of the plates, or any other means substantially the same. 4th, Inking in a different color the registering figures, by means of a separate inking apparatus. 5th, The printing the numbers on the tickets while the said tickets are continuously advancing, in the manner described. 6th, The guide placed between the impression cylinder and the cutter, or its equivalent, for restraining the strip of continually advancing paper in its proper direction, while its lower end is stopped by the action of the cutter when separating a ticket from the roll. 7th, The combination of the parts by which the tickets are deposited (after being cut) in a vertical position in contradistinction to flatwise in the trough destined to receive them. 8th, The combination of the slide, the spring catches, and the sliding block, by which accumulating tickets are kept in a vertical position.

108. ATTACHING CARRIAGE THILLS TO AXLES; F. L. Kidder, Williamsburg, New York.

Claim—The arrangement and combination of the pivoted spring plate, thill, spring, hook, and self-adjusting key, as described.

109. CORN HARVESTERS; J. H. Kite, Conrad's Store, Virginia.

Claim—The combination and arrangement of the horizontally revolving cutters, vertically revolving

bevel wheels, having plain peripheries, endless apron, axle, hollow shaft, and peculiar spring clutch arrangement, as set forth.

110. Machine for Turning Irregular Forms; D. H. Krauser, Pottsville, Pennsylvania.

Claim—1st, The manner of causing the carriage which supports the work to traverse over the cutters by means of the pulleys, belts, and endless chain, crank arms, and connecting rods, operating in combination with the means described for turning the work on its axis through the plates, bent levers, pawl, and ratchet wheel. 2d, The arrangement of the pulley, belt, and spindle, in frame, with the reverse pattern wheel, arranged as described.

111. Moulding Female Screws; Edward L. Lamb and Samuel Wood, Keokuk, Iowa.

Claim—The match-plate having both the exterior and interior of the pattern formed on it, when the same is divided vertically on a centre line, adapted to a suitable flask and resting guides, on which the two halves of the plate can be withdrawn laterally in opposite directions from the core, for the purpose of moulding female screws, or other articles which do not admit of having the pattern removed vertically from the core.

112. Metallic Lining for Water Coolers; Thomas Lavender, Philadelphia, Pennsylvania.

Claim—The lining or casing of an ordinary metallic vessel with tin, prepared and applied in the manner described.

113. Clothes Fastener; Lucius Leavenworth, Trumansburg, New York.

Claim—A clothes fastener made of a single piece or block, and having an open, angular, or curved groove therein to receive and hold the line and clothes upon it by diverging or kinking said line, and thus simplifying and cheapening the clasp by dispensing with the button heretofore used.

114. Chimneys; Joseph Leeds, Philadelphia, Pennsylvania.

Claim—In combination with an outer chimney or casing and an inner passage, two or more ducts or passages between the two for heat, ventilation, or draft, when said inner passages or flues are made by setting on top of each other iron sections with flanches upon them, as described.

115. Cotton Presses; Nathaniel J. Lilly, Selma, Alabama.

Claim—The combination of the boxes, bar, and followers, with the shaft, having the opposite ratchet thereon and the swinging weighted catch hung in the bar, together with the rack and pinion, operating as set forth.

116. Machine for Cutting Staves from the Block; James Little, Evansville, Indiana.

Claim—The hollow cylinder provided with the knives and gauge strips, in connexion with the bed and the feeding-belts, or their equivalents, arranged to operate as set forth.

117. Cultivators; Daniel and A. S. Markham, and David Eldred, Monmouth, Illinois.

Claim—The frame formed of two parts connected by the traverse bars, and provided with the sliding or adjustable frames, with the bars and ploughs, attached as set forth.

118. Seeding Machines; Daniel and A. S. Markham, and David Eldred, Monmouth, Illinois.

Claim—The adjustable standard, knife, share, wings, or mould-boards, with or without the tube, arranged for joint operation as set forth.

119. Refrigerator; H. L. McAvoy, Baltimore, Maryland.

Claim—The combination of rising and falling shelf-frame with a non-conducting refrigerating casing, as set forth.

120. Cooking Stoves; Josiah V. Meigs, Nashville, Tennessee.

Claim—The arrangement of the bottom plate of the oven in the same plane as the top plate of the fire-pot, in connexion with the arrangement of the flues leading from the side of the fire-pot directly beneath the bottom of the oven and around it, as described.

121. Churn; Jeremiah Mitchell, Gosport, New York.

Claim—The revolving box or churn, constructed in the manner set forth.

122. Machine for Shearing Sheep; Wm. F. Morgan, Rochester, New York.

Claim—The arrangement of the cutting device, scroll spring, and necessary gearing, as described. Further, the pressure lever, substantially as described.

123. Iron Pavement; James Montgomery, City of New York.

Claim—1st, A metallic pavement, consisting of a series of ribs or laminæ in planes, parallel, or nearly so, connected at alternate or varying levels by webs of metal, as set forth. 2d, Constructing metallic paving plates with ribs or arches of greater vertical depth in their intervening portion than at or near their sustained edges. 3d, The described combination of a concave or other suitable formed rail, with the projecting edge, and the paving plate, A, and the underlying edges of the plates, A and A′, for the purposes set forth. 4th, The described construction and application of the buttress-plate in connexion with the plate, A, and curb-stones, for the purpose explained. 5th, Connecting the edges of ribbed or arched paving plates by tongue and grooved joints, as shown, or in any mechanically equivalent form.

124. Iron Pavement; James Montgomery, City of New York.

Claim—A street-paving, presenting on its upper surface a series of ribs corrugated or winding in a horizontal plane, as set forth.

125. Harvesters; James Willard Patterson and Levi Hanford, Baltimore, Maryland.

Claim—The combination of the cutting knife, the bar, and projections, upon the guards, arranged in the manner described.

126. Cooking Stoves; Richard Peterson, Philadelphia, Pennsylvania.

Claim—The protecting plate with its perforations, when arranged in respect to the oven, the fire-place, and the flues of an elevated oven cooking stove, in the manner set forth, so that the products of combustion, after passing from the body of the fuel, and at the point where they impinge against, and are dispersed by, the said protecting plate, prior to passing some over and others under the oven, may be met by, and intermixed with, jets of heated air.

127. Bee-hives; William Powers, Youngstown, Ohio.

Claim—The cap or cover of double walls, the inner one perforated, and the space between filled with charcoal, in the manner specified.

128. Cleaning Castings; Andrew Ralston, Middletown, Pennsylvania.

Claim—The combination of flexible pickers, brooms, or brushes, having a reciprocating, alternate, or oscillating movement with an elevating and depressing table.

129. Harvesters; Andrew Ralston, Middletown, Pennsylvania.

Claim—1st, The arrangement of the receiving apron, sheaf-trough, compressing hook, and levers, when used in connexion with the horizontal and inclined gathering aprons, as described. 2d, The use of the shocking carriage furnished with a shock chamber, having a movable bottom in two parts, as described.

130. Pen-wiper and Paper Weight; John L. Rowe, City of New York.

Claim—The base or weight with cup attached provided with the sponge, in connexion with the pressure pad or sponge connected with the base by means of the frame, and arranged as described.

131. Eraser and Pencil-sharpener; Archibald G. Shaver, Hartford, Connecticut.

Claim—The curved blade eraser with the circular edge pencil-sharpener, and the groove for finishing the pencil point in combination, in the manner described.

132. Cradle-wagon; George Smith, Brooklyn, New York.

Claim—A cradle and wagon combined, when the several parts are constructed in the manner described.

133. Cocks for Water Basins; Horace W. Smith, Hartford, Connecticut.

Claim—The intermediate spindle, in combination with the vertical valve, in the manner set forth.

134. Propeller; Simon P. Snyder and George W. Cook, Minneapolis, Minnesota.

Claim—The arrangement and construction of a propeller, as described, also inclining the shaft of a propeller in relation to the boat in two directions, as set forth. Also, the combination of a screw-thread on the propeller shaft, with a screw-thread in the brace-plates forming the hub of the propeller, and with keys, for the purpose of adjusting and fastening the wheel on the shaft.

135. Ice Pitcher; James H Stimpson, Baltimore, Maryland.

Claim—A double or treble-walled ice pitcher, having its inside wall or shell composed of iron or other metal lined or coated internally with porcelain, as described.

136. Cotton Presses; Uriah T. Stuart and Calvin E. Stewart, Fayette County, Tennessee.

Claim—The combination of the rack and pinion with the rope and windlass for operating a press with two pressing-boxes, constructed as described.

137. Manufacture of Shot; Charles B. Tatham, Brooklyn, New York.

Claim—The combination of the netting pot, the regulating valve, the conductor, and the set pan, as described, for dropping shot.

138. Lamp-lighters; Leopold and Joseph Thomas, Brooklyn, New York.

Claim—The arrangement of a trigger, or its equivalent, in such a relation to a serrated sector and to a ratchet wheel, that by the motion of the trigger, a piece of fuse from a roller is fed up and lit, in the manner specified. Also, the arrangement of a continuous fuse, in combination with the lamp.

139. Brick Machines; John Van Riswick, Washington City, D. C.

Claim—The combination and arrangement of the carved or angular hopper with the mould-disk and vertically reciprocating plungers, whereby the upper plungers are caused to pass the hopper without lateral movement, in the manner specified.

140. Grain Cleaning Machines; Hugh Wallace and Wm. Mellon, North Sewickly, Pennsylvania.

Claim—The arrangement of the valve, ducts, and sieves, as described.

141. Seed Planters; George Watt, Richmond, Virginia.

Claim—The series of angular faced rollers arranged relative to their shaft, as described, for opening the furrows, in combination with the seed tubes and covers.

142. Water Wheels; Charles Wells, Monroeton, and Wm. Douglas, Bradford Co., Pennsylvania.

Claim—The combination of the scrolls, vertical buckets, and lower buckets, arranged as described.

143. Churn; L. J. Wicks, Racine, Wisconsin.

Claim—The arrangement in a square churn, which is provided wich a ventilating top, of the shaft, inclined arms, cross-pieces, and funnels, in the manner specified.

144. Apparatus for Evaporating Fluids; C. S. Wheeler, Flowerfield, Michigan.

Claim—Combining the evaporating pan with the steam boilers, in such manner as to cause the upper sides of said boilers to form highly efficient heating surfaces within said evaporating pan. Also, conducting the steam from the boilers to the engine, which may be combined therewith, through the medium of a series of pipes, which are so located that their peripheries form portions of the heating surface of the evaporating pan; but this I only claim when the said evaporating pan is combined with a series of steam boilers. Also, combining the spaces between the double bottoms of the clarifying pans with the steam boilers, when the said pans and boilers are arranged with each other and with the evaporating pan, as set forth. Also, the passing of the fluid to be reduced through a coil of pipe, located within the chimney or flue space, before discharging the same with the clarifying pans; but this I only claim when the said clarifying pans are arranged with the evaporating pan and the series of steam boilers, as set forth.

145. Burning Fluids; Wm. Wilber, City of New York.

Claim—A fluid compound for burning in lamps, &c., made of coal tar, camphene, and alcohol, substantially in the proportions and manner set forth.

146. Ploughs; Solomon Williams, Jr., Hume, New York.

Claim—The arrangement of the adjustable wheel with the landside of the plough, as described.

147. Firemen's Protector; C. D. Woodruff, Toledo, Ohio.

Claim—The double-walled sheet or plate metal house, and mounted on wheels, and provided with look-out holes, and an adjustable plate to receive the nozzle or butt, the house being placed on rollers in the platform, and secured by buttons, or their equivalents, arranged as set forth.

148. Seeding Machine; E. O. Baxter, Assignor to self, E. H. Riley, and W. T. Sweet, Forreston, Illinois.

Claim—1st, The cam, one or more, attached to wheel, in combination with the jointed pendant attached

to the lever. 2d, The levers, connected together and arranged relatively with each other and the driver's seat, as specified.

149. Electro-magnetic Machines; W. H. Burnap and J. A. Bradshaw, Assignors to W. H. Burnap, Lowell, Massachusetts.

Claim—Applying the oscillating balance wheel with its shaft in line with, but detached from, a rock shaft or its equivalent, carrying an arm which derives a positive oscillating movement from the train of gearing which drives the magnetic-electric machine, and connecting the spring, which is attached to said balance wheel, with the so arranged moving arm, as specified.

150. Burglar Alarm; R. M. Campbell, East Cambridge, Assignor to W. G Crombie. Boston, Massachusetts.

Claim—The application of the spring fastener to the alarm or its case, so as to be capable of sliding and turning with reference to the same, as specified.

151. Electro-magnetic Fire Alarm Apparatus; M. G. Farmer, Salem, and W. F. Channing, Assignors to W. F. Channing, Boston, Massachusetts.

Claim—1st, The independent keys with their pins, in combination with the rack and a means of liberating the rack, for the purpose set forth. 2d, The arrangement of the segments on the circuit wheel, in combination with the springs, or their equivalents, for throwing the electric current successively on to different circuits. 3d, The double circuit wheel, or its equivalent, for the purpose of completing and interrupting an electric circuit at both ends.

152. Table Caster; R. Gleason, Jr., Assignor to R. Gleason & Sons, Dorchester, Massachusetts.

Claim—A caster, egg-stand, and table bell, arranged as described.

153. Extension Table; Thomas Gray, Assignor to self and J. M. Sankey, Philadelphia, Pennsylvania.

Claim—1st, The method of constructing and of connecting together the two cross-bars, H and H′, that is to say, constructing one bar, H, in two parts, and connecting the two parts together by the two plates, which admit the bar, H′, and afford a means of joining it to the bar, H′. 2d, The combination of the screw, block, bars, and cross-bars, with the two ends of the table, arranged as set forth.

154. Machine for Hewing Out Hubs; G. W. Miles, Michigan City, Indiana, and P. P. Lane, Assignors to Lane & Bodly, Cincinnati, Ohio.

Claim—1st, The arrangement and combination of the axles, stud shaft, and rotating rest, for hewing out cylindrical forms, in the manner set forth. 2d, In combination with the above, the ways, carriage, feed arm, pawls, and rack, as explained.

155. Register for Sheets of Paper; John North, Middletown, Connecticut, Assignor to self and D. Appleton & Co., City of New York.

Claim—1st, The attachment to the feed table of the printing press of two or more register points in addition to those commonly used for printing, so as to make register point holes in the sheet to be printed at the exact points required for the purpose of feeding the sheet in register to the folding machine to be folded. 2d, The application for that purpose of the described mechanism, or other suitable mechanism of the same general description, attached to the feed table, frame, and carriage of the printing press, and which will produce the intended effect.

156. Bedstead; Samuel McQueen and Wm. Lyon, of the District of Abbeville, South Carolina, administrators of the estate of B. M. Lyon, deceased.

Claim—The use of the hinges in the middle of both the cross and longitudinal rails, in combination with the hinges between the rails and posts, as specified.

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157. Adjustable Wormer for Ramrods; George E. Baldwin, West Meriden, Connecticut.

Claim—A wormer that can be run out of or into a ferule on the end of a ramrod, so that the ramrod can be practically shortened or lengthened at pleasure.

158. Breech-loading Fire Arms; Joseph Barber and P. C. Reinfried, Bridesburg, Pennsylvania.

Claim—The arrangement and combination of the spring trigger guard, pin, toggles, sliding belt, and catch, as described.

[This invention consists of a sliding bolt connected with a toggle below the stock, and an elastic spring trigger guard, acting in combination with a beveled catch in the breech to lock the latter in line with the barrel for discharging, and also to unlock it for loading. A spring is also arranged below the breech to raise it to position for loading when it is unlocked.]

159. Chair Bottoms; Z. B. Bellows, Cortlandville, New York.

Claim—The application to chairs of a bent, stamped, or pressed board for a seat.

160. Magazine Fire Arms; Paul Boynton, Canton, New York.

Claim—1st, Combining the powder magazine in the stock with the barrel of a fire arm, by means of the faucet-like chambered breech, applied and operating as described, to measure its own charge. 2d, Combining the bullet-loading slide with the faucet-like chambered breech, by means of the ears on the slide, and the horns attached to the breech, that the slide may be operated in combination with the breech, in the manner specified. 3d, The combination with the faucet-like breech of the priming box, and its perforated collar, q, operated by a connexion with the hammer.

[This invention consists in providing for the loading at the movable breech, with loose powder from a magazine within the stock, and with balls from a magazine under the barrel, whereby the operations of loading and firing are executed with great rapidity. By the act of cocking the hammer, a contrivance combined with the breech furnishes the priming for every charge.

161. Machine for Bending Wood for Felloes; George A. Brown, Newfane, New York.

Claim—The arrangement of the platform, screws, and spring, with the mould-block, constructed in the manner specified.

162. Machine for Grinding and Polishing Saws; Samuel S. Campbell, Montreal, Canada.

Claim—1st, The specified arrangement of the longitudinal carriage ways on supports, so that they, with the carriage and all attachments, may be inclined laterally, and caused to stand obliquely to the horizon, or the circumference of the lap or grinding-stone. 2d, Arranging one of the supports of the machine on a pivot and the other on a truck, which reciprocates on a circular railway, so that the carriage ways and carriage,

with all attachments thereof, may be adjusted in the path of a circle, so as to stand oblique to the shaft of the lap or grindstone. 3d, Providing the longitudinal reciprocating carriage with a stationary stop and a capping or holding down plate, which is adjustable up and down, but stationary longitudinally.

163. Apparatus for Regulating the Supply of Water to Steam Boilers; J. M. Colman, Vincennes, Ind.

I do not claim the float in boiler, or the cranks, levers, water-chest, valve, or detector. But I

Claim—The combined arrangement of these to effect the object desired, to regulate the water in a steam boiler to any desired point, from which it cannot materially change.

164. Packing Cartridges; Samuel Colt, Hartford, Connecticut.

Claim—The application of a string, wire, or other equivalent, to a cartridge package or box, by which the package or box may be opened.

165. Grinding Apples; A. Dean, Jerusalem, New York.

Claim—The crushing lever and horizontal wheel, constructed as described. 2d, The eccentric wheel and carriage, in combination with the cutter and wheel, I, constructed in the manner described.

166. Preventing Collisions on Railroads; Abram Dehuff, York, Pennsylvania.

I am aware that the shoe or boot running under the wheel is not new; it has been made by others, and I do not claim it. But I

Claim—The spring carrier hung on two inclined staples beneath the car or truck, to hug or embrace the wheels, cross-bar, C, long bar, E′, lever, F, rod G, lever, H. rod. I, levers, J J, and levers, K, arranged as described.

167. Machine for Folding Wool; R. D. M. Edwards, Franklin, Michigan.

Claim—The table rim, the folding lids, operated by catches, levers, and springs, riser, and platform, constructed as set forth.

168. Hanging Well Buckets; S. F. Dexter, Paris, New York.

Claim—1st, The iron strap with the levers and notch to receive the spring stretcher. in combination with the chain and the manner of detaching the same by coming in contact with the rod. 2d, The springs, when operated as described. 3d, Hanging the buckets at or below the bottom, in combination with the spring or springs and levers, as described.

169. Corn Planters; Stephen Elliott, Washington, Indiana.

Claim—The arrangement of the wheel and pins, the spiral springs, the boxes, blocks, the rod, indicator, and leveling plough, constructed as described.

170. Obtaining Curved Printing Surfaces; Wm. H. Elliott, Plattsburg, New York.

Claim—1st, The combination of screws with the concave cylindrical form, when these devices are used for bringing the compound flexible matrix or impression sheet to the required shape, or for holding it there, while metal is being deposited or cast upon it, for the purpose of constructing electrotypes or stereotypes. 2d, The employment of bars in combination with the flexible sheet for holding the matrix in a cylindrical form, when said bars are so applied to the ends of said sheet, that they shall prevent its being displaced or springing up from the concave face of the outer shell, whether said bars are attached to or rest against the edge of said sheet. 3d, The grooves in the inner shell, for casting upon the back of cylindrical type plates, lugs, or flanches, by which said plates may be fastened upon a cylinder, as set forth.

171. Sugar Mills; Ralph Emerson, Jr., Rockford, Illinois.

Claim—The combination of parts in the machine, in such manner as to subject the cane first to a lighter pressure, and afterwards to a heavier pressure, and to deliver the respective juices expressed by said lighter and heavier pressures into separate receptacles, for the purpose specified. Also, the combination of the gauge fillets with the pressure rolls, whereby any unskilled operator is enabled to adjust and work the machine.

172. Process for Extracting and Assorting Vegetable Juices by Pressure; Ralph Emerson, Jr., Rockford, Illinois.

As I have procured a separate patent for the said mill, I refer to that patent for a more full description of it. In this patent I do not mean to limit myself to any special means for the extraction and separation of the pith and rind juices. But I

Claim—The process of expressing and collecting the juice of the pith separately from that of the rind, for the purpose set forth. Also, as one of the methods (and the best to me known,) whereby the process of extracting the juices separately may be beneficially carried into effect, the subjection of the cane to a light pressure, to express the juice of the pith, previously to the employment of a heavier pressure, to express the juice of the rind, whether the said pressure be successively performed in the same or in different machines.

173. Watch Chains, &c.; Henry Epstein, City of New York.

Claim—Constructing a watch chain, which may be made stiff or inflexible at pleasure, by the turning of part of the tubular casing to which an interior chain is attached, in the manner described.

174. Operating Feed Rollers for Planing Machines; B. Fitts, Worcester, Massachusetts.

Claim—The arrangement of the gears in combination with the eccentric, constructed in the manner set forth.

175. Self-priming Fire Arm; C. W. B. Gedney, City of New York.

Claim—The pivoted chamber or magazine within a recess in the hammer head, and operated by a link pivoted to the lock-plate, or some other stationary part of the pistol or other arm. Also, cutting off the priming of the edge of the hammer face, and carrying the same into the proper position for exploding upon the nipple or cone.

176. Combined Letter and Envelope; E. B. Gleason, Boston, Massachusetts.

Claim—The combination therewith (that is, the letter sheet,) of the envelope composed of the superscription and post-mark portion, and the single flap, or the same and the two flaps, arranged together and with respect to the letter or billet portion, as described.

177. Barrel Packer; W. H. Glasgow, City of New York.

Claim—1st, The rotary cam with barrel attached, in connexion with the vibrating hammer. 2d, The plate, having a rotary and a vertical reciprocating movement, for the purpose specified. 3d, The cam, plate, and hammer, arranged for joint operation as set forth.

178. Apparatus for Heating and Purifying the Feed Water of Steam Boilers; Jacob Gulmann, Rochester, New York.

Claim—The combination and arrangement of the bent siphon-shaped tube, having the induction and

eduction openings at the highest parts thereof, with low receiving portion, whereby the water is made to pass a considerable space of vertical pipe the more effectually to deposit its impurities in D', both while descending and ascending, together with the waste-cock and conjoint cocks, lever, and connecting rods and cranks, as described, for simultaneously opening and closing the same.

179. Machine for Dressing Heels of Boots and Shoes; Horatio Guild and Luther Hall, Boston, Mass.

Claim—The combination of the adjustable hub, jaws, and pattern thereof, with their curved supporting rack and the self-adjusting knife or knife-frame, applied together, and to a bed or table, or the equivalent thereof, as specified.

180. Meat Mincer; A. W. Hale, New Britain, Connecticut.

Claim—A cutting or mincing machine, operating by means of a cylinder or cylinders, having tapering grooves extending from end to end, in combination with, and revolving in, fluted or ribbed cases, and acting against a stationary knife or knives placed in a plane parallel with the axes of the cylinders.

181. Compositions for Roofing; John Hobrecker, Quincy, Illinois.

Claim—The process described of preparing plastic material of the composition stated, without the aid of external heat, for the purposes set forth.

182. Ships Lights; Enoch Hidden, City of New York.

Claim—1st, The swivel wrench of the button, and supporting the shaft or spindle thereof by the brace-piece above the frame. 2d, The inclined surfaced button with swivel wrench, in combination with the slotted lug of the main frame. 3d, In combination with the aforesaid construction, the attachment of the light frame to the main frame, by means of the hook and pin, as described.

183. Hoop-lock for Securing the Ends of Metallic Bands; P. C. Ingersoll, Green Point, New York.

Claim—The loop and key fitted together and applied to the hoop, as set forth.

184. Rotary Planing Machine; H. C. Ingraham, Guilford, and H. S. Ingraham, Granger, Ohio.

Claim—The arrangement of the cylinder with the two upper feed rollers and the matching burrs, in combination with the vertical sliding frame, for the purpose of preserving the same thickness of timber between the face of the board and the tongue and groove. Further, the sliding gripe, in combination with the ways, lever, and ratchet, arranged in the manner set forth.

185. Mode of Oiling Journals; D. B. Jordan, Woonsocket, Rhode Island.

Claim—The combination and arrangement of the shafts, the disk, the sliding valve, and the spout, constructed as described.

186. Spark Extinguisher; James Keniston, Cincinnati, Ohio.

Claim—A tank, arranged beneath the boilers of furnaces in such manner as to receive the sparks and cinders therefrom, and extinguish and discharge them by means of a current of water passing through the tank, as described.

187. Lanterns; W. M. Kimball and K Hartman, Cleveland, Ohio.

Claim—The segments, the spring, and arm, or their mechanical equivalents, in combination with the hooks, arranged in the manner specified.

188. Locks and Latches; W. S. Kirkham, Branford, Connecticut.

Claim—The combination of the nosing provided with the double inclined flanch, with the bolt or latch, having its outer end rounded and leveled in a vertical plane, to operate in the manner set forth.

189. Peach-cutting and Stoning Apparatus; J. C. Kuhn, Boonville, Arkansas.

Claim—The knives curved and crossing each other and attached to the elastic bars, in combination with the lever provided with the pin. Further, the above parts, when placed on the box provided with a tube, and the several parts arranged relatively with each other, so that the stones will be separated from the pulp or flesh.

190. Railroad Gates; Shields Liggett, Staunton, Virginia.

Claim—The opposite sliding sectional gate, in combination with the levers, F F', rods, levers, G G', sliding bars, and springs, arranged as set forth.

191. Stereoscopes; William Loyd, Philadelphia, Pennsylvania.

Claim—A stereoscopic instrument having eye glasses at opposite sides and double reflectors, in combination with a revolving picture-holder, arranged as described. Also, the grooves on opposite sides of the frames, for the purpose of holding two pictures in contact with each frame.

192. Loading Ordnance; W. E. Moore, Crawfordsville, Indiana.

Claim—1st, The combination with a cannon, or other piece of ordnance, of a system of mechanism which will receive the charge, carry it opposite the bore of the cannon, force the same up to the breech of the cannon, and then be capable of being moved out of line with the bore of the same. 2d, In combining with the above system of mechanism, a needle for pricking the cartridge after it has been forced up to the breech, said needle coming into action simultaneously with the retreat out of line with the bore of the cannon, of mechanism employed for introducing the charge, and then retreated out of the way, ready for the application and explosion of the cap. 3d, The combination of a cap charger and exploding hammer with the first and second systems of mechanism above claimed, whereby simultaneously with the retreat of the needle a cap is brought over the touch-hole and exploded. 4th, A cartridge box, which has a yielding spring stop, in combination with the first system of mechanism above mentioned.

193. Car Brakes; W. E. Moore, Crawfordsville, Indiana.

Claim—1st, Making the windlass chain shaft in two parts, and uniting said parts by a universal joint, and arranging the main friction roller on one section of the shaft, and the windlass drum on the other. 2d, The employment of an auxiliary friction roller, in combination with main roller and locomotive driving wheels, when said auxiliary roller is arranged to rise the main friction roller and the locomotive wheel, through the peculiar scale beam or weighing arrangement. 3d, The employment of a pivoted pawl, in combination with a racket drum having two circles of reversed set teeth, which incline on their deepest faces toward the centre of the drum.

194. Bottle Stopper Fastenings; H. W. Putnam, Cleveland, Ohio.

Claim—The bottle stopper fastening formed of two pieces of wire, the same being united by means of the points passing through the loops, constructed and having the wire adapted to them as herein described; thus forming a hinge and securing the same to the neck of the bottle by looping together the ends of the wire.

195. Mode of Applying Springs as a Motive Power; G. W. Morgan, Plattsburgh, New York.

Claim—The arrangement of the springs and wheels with lugs and pinions, concentrating the power on the pinions on each side of the wheel, and the pinions and shafts for winding up, at the same time, all the springs on either side of the wheel.

196. Speaking Tubes for Ships; D. S. Neal, Lynn, Massachusetts.

Claim—The arrangement of the speaking tube with a cask, or equivalent float, as specified.

197. Meat Cutter; J. G. Perry, Kingston, Rhode Island.

Claim—1st, Placing the knives on or across the shaft and holding them by their ends, to prevent them from turning. 2d. The manner of constructing the shaft and stud plates, as set forth.

198. Fastening for Folding Doors; E S. Roberts, Brooklyn, New York.

Claim—The combination of the sliding bolts applied to folding doors, to operate as set forth.

199. Steering Apparatus; G. W. Robinson, Boston, Massachus tts.

Claim—The segment having the teeth on the interior vertical face of the curve, in combination with the gears and shaft connected with the tiller, and moving therewith, arranged in the manner set forth.

200. Preparing Hop Liquor for Brewers; A. S. Rollins, Albany, New York.

Claim—The preparation of hop liquor, for the purposes of distilling and brewing by the process set forth.

201. Water-wheel; P. H. Roots, Connersville, Indiana.

Claim—The wheel and rotating breast or abutment moving with different degrees of velocity, in combination with the apron or concave, arranged as set forth.

202. Washing Machine; J. L. Rowley, Angola, Indiana.

Claim—Constructing the bottom of the box with three sides of an octagon, the two outer sides to have ribs of an octagonal shape, set at an angle of 45° with the sides of the box and bottom, to be horizontal, with two rows of rubbing pins or knuckles set alternately with the valleys between the ribs, in combination with the vibrating rubber, having the rubber surface octagonal, and the rubbing knuckles set so as to work alternately with the spaces between the pins in the bottom of the box, and diagonally with the ribs on outer sides of the bottom.

203. Cast Iron Rails for Railways; J. E. Russell, Brooklyn, New York.

Claim—A cast iron railroad rail, having its neck vertically corrugated, as described.

204. Apparatus for Evaporating Sugar Juices; James Smart, Mansfield, Ohio.

Claim—1st, In the construction of pans, the combination of the inclined bottom with the inclined zigzag partition. 2d, The combination of two pans and two flame chambers, of the peculiar construction described. 3d, Supporting the pans at or near the centre of their length by pivots, and at their ends by spiral springs, as set forth.

205. Machine for Freezing Cream, &c.; S. W. Smith, Brooklyn, New York.

Claim—1st, The cylinders, in combination with the scrapers and reservoir, constructed in the manner described. 2d, Combining with the cylinders a perforated distributing reservoir, for the purpose of furnishing the material in the desired quantities to the cylinders.

206. Electro-magnetic Medical Apparatus; Heinrick Soltmann, City of New York.

Claim—The arrangement of the vibrating spring armature and the connexions therefrom, in combination with the key, arranged and acting as specified, to throw the shock off the person, or repeat the same. Also, the regulating cylinder, constructed in combination with the medical electrical machine, fitted and acting in the manner set forth.

207. Lever Jacks; Frederick Stamm, Lampeter, Pennsylvania.

Claim—The combination and arrangement of the lever and link rod, hinged together with the block and link seats, as described.

208. Rotary Stave Machine; George Starkweather, Hartford, Connecticut.

Claim—The horizontal revolving cutting rims for dressing staves on the two opposite sides at the same time. Also, the arrangement of one or more feed boxes upon the plate over the cutters, with the feeder produced from the worm.

209. Sugar Mills; T. E. Hunt, Assignor to self and N. T. Hunt, Indianapolis, Indiana.

Claim—1st, The combination and arrangement of the frame, rollers, and gearing. E, with the cone, gearing, F, bolt, and spring, constructed as set forth. 2d, The trough with aperture, constructed as set forth.

210. Device for Raising Water; D. E. Teal, Norwich, New York.

Claim—The arrangement of the rope or chains, the hooks, and bail of the cast iron box, adjustable flanch, collars on the windlass, and the windlass, whereby the bucket can be lowered, filled with water, raised and lowered, by merely turning the windlass.

211. Washing Machine; G. W. Tolhurst, Liverpool, Ohio.

Claim—The shaft, blocks, and wedges, or their equivalents, in combination with the oscillating rubber, slatted bottom, dirt chamber, and box, arranged as set forth.

212. Sail Wagon; William Thomas, Benton Co., Arkansas.

Claim—1st, The combination of the spars and cargo box on the rocking shaft, thus lowering the centre of gravity and increasing the stability of the fabric, not only in this way, but by also, and as another effect thereof, allowing the sails to yield to violent gusts of thwart wind, receiving their force gradually, and spilling it more and more as they decline. 2d, The hollow wheel hub, which I have called the barrel hub, to be used for the purposes of freight, thereby relieving the axle, avoiding friction, and adding to the power of the vehicle to stand up safely against strong cross winds.

213. Locomotive Fire-boxes; W. R. Thomas, Catasauqua, Pennsylvania.

Claim—The removable lining fitting with the shell and under the permanent water spaces of the fire-box, having inwardly projecting inclined sides, and combined with the water spaces of the boiler, by means of two rows of vertical tubes entering the crown sheet, and a pipe connecting with the body of the boiler.

214. Railroad Car Journal-boxes; Philip Umholtz, Tremont, Pennsylvania.

Claim—The spring yoke bolt, in combination with the follower and packing operating in the mortise of box, in the manner described.

215. Horse Power; J. S. Upton, Battle Creek, Michigan.

Claim—The arrangement of driving wheel with the pinions and wheels, in combination with the annular wheel, with toothed gear on its internal edge and on one of its faces.

216. Clasp for the Ends of Bands of Iron; Chapman Warner, City of New York.

Claim—The construction of a clasp of any material or dimensions of the form described, with two wedge-shaped projecting tongues placed in the position, fitted with sleeves, and protected by sides.

217. Railroad Car Coupling; N. H. Wentworth and M. S. Ames, Somersworth, New Hampshire.

Claim—Combining with each latch or catch a lever, as described, and providing the latch and lever, when thus combined, with the cams and their shafts and crank-arms, for actuating them.

218. Bread-making Table; W. K. Wyckoff, Ripon, Wisconsin.

Claim—The combination and arrangement of the flour chest, the table or mould-board, the mixing tray, and the closet, as described.

219. Steering Wheel; C. T. E Blaich and P. A. Bishop, Assignors to P. A. Bishop, Elyria, Ohio.

Claim—The vertically sliding dog being secured in suitable brackets and provided with a foot-piece, pawl, and joint, as described, in combination with the spiral spring and ratchet.

220. Sewing Machines; E. S. Boyton, City of New York, Assignor to P. R. Roach, Elizabeth City, N. J.

Claim—The use use of the adjustable fulcra for controlling the feed of the needle, in combination with an annular or ring-shaped shanked wire needle, as attached directly to the crank shaft, without the intervention of a needle box

221. Hanging Reciprocating Saws; Addison Crosby, Assignor to H. S. Stephens, Fredonia, New York.

Claim—The two jaws or plates applied to the saw, connected together and suspended within the swinging or pivoted adjustable frame, which is attached to the plates.

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222. Scythe Snaths; S. B. Batchelder, Lowville, New York.

Claim—The arrangement of the hooks, screw, ring, and plate, with slot and sliding block, constructed in the manner described.

223. Wheels for Traction Engines; Wm. Bray, Folkstone, England; patented in England, Dec. 31, 1856.

Claim—Constructing traction engines with driving wheels with blades or teeth which are capable of being protruded and withdrawn.

224. Submarine Telegraph Cable; F. J. Bridges, City of New York.

Claim—The braided or plaited coat, covering, or layer for conductors, cords, or cables, for electric telegraphic purposes, as set forth.

225. Metallic Bands for Baling; George Brodie, Little Rock, Arkansas.

Claim—Preparing the hoops or bands for tying before they are passed around the bale, by bending one or both ends of the hoops or bands, and placing in the inside of each band a suitable prepared metallic pin similar to those I have already described, around which pins the bent end of the hoops are securely pressed, for the purpose of keeping the pins in place. and also making the ends of the hoops wider or thicker as the shape of the connecting links used may require. Also, forming the connecting links like those shown. Also, bending one or both ends of the hoop or band around the outer ends of the connecting link, thereby strengthening the ends of the link, and preventing it turning or getting out of place, and the tie from untying. Also, making metallic hoops for bending bales, with a tie on each side of the bale. Also, using strips of cloth, paper, or other suitable material, under the metallic hoops, for the purpose described.

226. Fastening for Shirt Studs, &c.; Barnes Clayton, Philadelphia, Pennsylvania.

Claim—The stem rigidly fixed to the piece of the back part, the vertically moving lever plate, and the screw stem fixed to the front or ornamental part, and for the purpose of fastening the stud in place, so that it cannot be pulled out or removed therefrom, without first rotating the screw, as described.

227. Adjustable Dental Swages; E. H. Danforth, Jamestown, New York.

Claim—Forming the labial and the lingual curve of dental plates for the inferior maxillary alveolar ridge, by swaging it into form with the compound die and malleable plates in the curve of the plate.

228. Instrument for Ascertaining the Distance between itself and the Target, without Chaining; B. D. Villeroi, Philadelphia, Pennsylvania.

Claim—The addition, by means of a screw, of a tube containing the lens, and divided throughout its whole length by a vertical partition or diaphragm. At the extremity of this tube, next the eye-piece, is placed a ring containing a bisect lens, the two halves of which are equally inclined on opposite sides of the vertical plane, perpendicular to the axis of the telescope.

229. Corn Huskers; H. A. Doster, Bethlehem, Pennsylvania.

Claim—The arrangement and combination of the lever with the adjustable roller, so that when the roller is adjusted, the distance between the cam and the fulcrum of the lever will be correspondingly changed.

230. Weather Strips; John L. Faber, Sr., South Headly, Massachusetts.

Claim—1st, The bar, in combination with the parallel vibrating links, when said bar is so arranged as to fall by its own weight, and be forced against the door by the closing of the latter. 2d, The combined arrangement of the several strips and their attachments, to close up the frame sides of the door.

231. Filters; John Fitch, Seneca Falls, New York.

Claim—The combination of the cylinder, constructed and partly filled with the outside case, having the perforated plates and the filtering material disposed and arranged as described, by means of which the fluid to be filtered is made to pass through the filtering material for a greater distance, and a more perfect purification effected. I also obtain, by the same combination, a convenient mode of cooling the fluid, and also of cleansing the filter, without deranging its parts, by means of reversing its action.

232. Coffee Mills; R. B. Fitts, Philadelphia, Pennsylvania.

Claim—The cylinders, B and B, in combination with the grooved cylinder, C, and and its adjustable concave, arranged together beneath the hopper, so as to operate in the manner described.

233. Fly-wheels for Rolling Mill Machinery; Jacob Geyser, Allegheny, Pennsylvania.

Claim—Constructing the rim of a fly-wheel hollow, with partitions, in such a manner that when the heavy materials are piled in, laid in concrete, it may be held stiff and steady. Also, using any heavy and hard material along with suitable cement, to fill up such a rim.

234. Letter Envelopes; Emanuel Harmon, Washington City, D. C.

Claim—The method or process of preparing letter envelopes ready ruled in the process of manufacture, in the manner set forth.

235. Dough Rolling Machine; John Hecker and Wm. Hotine, City of New York.

Claim—The combination of an inclined endless apron for receiving and returning the dough, in combination with the cylinders for rolling the dough. Also, in the above combination, the curving in of the apron around the upper roller, or the equivalent thereof, for the purpose of returning the dough to the feed table, in combination with the cylinders for rolling the dough. Also, the rotating screen, in combination with the arrangement of cylinders for rolling and working the dough. Finally, in combination with the rotating screen, the hopper and apparatus therein, for insuring a regular supply of flour.

236. Filters; A. Jaminet, St. Louis, Missouri.

Claim—1st. Circulating the water to be filtered through tiers or courses of pipes, arranged within a drum, having a current of waste steam passing through it, and then passing said water into separators for further circulation, and of depriving it of mud and other foreign matters. 2d, Arranging the separators within the steam drum. 3d, Making the apparatus self-cleansing, at intervals, by operating the valves at the bottom of the separators and filters, by levers acted on by toothed discs, ratchet wheel, and pawl, or their equivalents, actuated by the automatic movement of the clear water trough in tippling or tilting, to discharge essentially as set forth. 4th, Controlling the automatic discharging action of the clear water trough, by means of a flutterer or float, arranged therein, and serving, by connexion with an unlocking lever, a stop-piece, and catch or hook, to hold the trough from prematurely tilting.

237. Making Ornamental Chains; James Launcelott, Cranston, Rhode Island.

Claim—The method described of weaving a chain from sheet metal, by forming the base of each link into a geometrical figure, and by bending each arm longitudinally, at the same angle as one of the outer angles of the base, so that a cross-bar on the extremity of the next proceeding link shall, when bent down, bear against the angular side of two of the arms of the next succeeding link, and thereby enable the chain to withstand a strain nearly equal to the cohesive strength of the metal of which the links are formed.

238. Mode of Marking and Ornamenting Paper; Thomas Mackenzie and Albert Trochsler, Boston, Mass.

Claim—Paper for writing, printing, and other purposes, having indelible marks or designs stamped thereon, by condensing the fibres thereof by pressure.

239. Motive Power; Charles Mans, Danville, Pennsylvania.

Claim—The arrangement of the drums, wheels, pinions, fly-wheel, and sectional weights, combined as described.

240. Breech-loading Cannon; James H. Merrill, Baltimore, Maryland.

Claim—1st, The combination of the breech-piece and frame, so that the former may move back and forth, and have its bore raised up and lowered on the latter automatically, and fastened or locked. 2d, In combination with the screw for running the breech-piece forward and backward, the mechanism for lowering and raising the rear of said breech-piece.

241. Post-office Hammer Stamp; Ezra Miller, Janesville, Wisconsin.

Claim—A post-office marking stamp, which has its handle running parallel, or nearly so, with its marking face or faces.

242. Device for Equalizing the Tension of Watch Springs; J. J. Parker, Marietta, Ohio.

Claim—Making and constructing a barreled cog-wheel or drum for time-pieces, or for other purposes, so as to equalize and regulate the power of a spring, in manner set forth.

243. Envelope; S. E. Pettee, Assignor to the North American Paper Bag and Envelope Manufacturing Company, Philadelphia, Pennsylvania.

Claim—The form of envelope blank described and represented, whether cut from a continuous roll of paper, or from separate sheets.

244. Faucet; James Powell, Cincinnati, Ohio.

Claim—The arrangement of the cam, flanches, longitudinal slot, and spurs, combined in the manner set forth.

245. Rotary Engine; T. T. Prosser, Fond du Lac, Wisconsin.

Claim—A wheel with a spiral passage diminishing in size from the centre to the periphery, as described.

246. Heels for Boots and Shoes; Joseph Read, Philadelphia, Pennsylvania.

Claim—A composition heel for boots and shoes, consisting of the composition moulded into the form of a heel, with the concavity in the upper side of the same, as described, and the leather lift or bottom piece, in combination with the leather edge piece, applied and secured thereto, as set forth, the said heel being adapted for subsequent application to a boot or shoe.

247. Amalgamator; H. P. Russ, San Francisco, California.

Claim—Portable or movable cups or cones of copper, galvanized or amalgamated with quicksilver inside, or manufactured of other materials, such as wood, cast iron, &c., to be placed in holes in sluice boxes, or other apparatus used in mining for the precious metals.

248. Pump; L. B. Schafer, Baltimore, Maryland.

Claim—The arrangement for operation together of the pump, shear, link, hand brake, and piston rod, as set forth.

249. Brick Machine; J. T. Schuffenecker, Keokuk, Iowa.

Claim—1st, The safety openings, in combination with the quadrant, arranged and operating in the manner specified. 2d, The shutter operated by the fork, spring, and bar. 3d, The manner of leveling the mortar in the moulds by means of the two scrapers.

250. Instrument for Enlarging Photograph; David Shive, Philadelphia, Pennsylvania.

Claim—The arrangement of the illuminating lens in the usual open end of a photographic camera, supported in connexion with the adjustable paper-holder upon a stand, so as to operate in the manner specified.

251. Casting and Annealing Articles made of Scoria; Wm. H. Smith, Philadelphia, Pennsylvania.

Claim—1st, The construction and use of the horizontally revolving casting wheel, for facilitating the casting of slag and similar mineral products. 2d. The construction of an annealing chamber having various modes of retaining and regulating the heat therein, viz: by a series of dampers, by the construction of grooves and troughs in the walls, in connexion with the flanches and dippers of the bed, with or without the use of sand, by the devices at the ends of the wagons, and by the use of the ante-chambers. 3d, The use and combination of a series of rollers with a traversing bed, for imprinting an entire pattern of different colored figures. 4th, The construction and employment of segmental sliding moulds, as shown, or of similar character, and the mode of arranging and working the same, as described.

252. Gas Burning Stove; James Spear, Philadelphia, Pennsylvania.

Claim—The combination of the sled in the door frame with the ring, and the cylinder, and the body of the stove, constructed in the manner set forth.

253. Apparatus for Skimming the Surface of the Water in Steam Boilers; A. M. Sprague, Mobile, Ala.

Claim—The surface skimmer, constructed as described, for the purpose of removing the sedimentary water from the upper water surface of steam boilers.

254. Car Coupler; C. E. Stevens, City of New York.

Claim—The combination of the yielding support within the mouth of the aperture of railway car boxes, with one or more blocks inside and the annular flanch outside the said boxes, arranged as described, to effect the coupling of the boxes automatically, by the action of straight links and locking bolts.

255. Mode of Fastening Sheets of Paper together; E. S. Swartwout, Utica, New York.

Claim—The metallic clasp, in combination with the perforated metal plate, for fastening together legal and other documents, constructed as described.

256. Cheese Press; Charles Taylor, Little Falls, New York.

Claim—1st, Attaching the one end of the press bars to the bottom of the box, and the other end of the crank pin on the wheel, whereby I am enabled to shorten the movements of the follower, and have an eccentrically operating press, compactly arranged. 2d, The spring bed-piece and the spring acting upon the wheel, on the extreme upward movement of the follower, and thus upholding the follower.

257. Filter; Louis Tilliers, West Morrisiana, New York.

Claim—A hygienic purifier, constructed in the manner and operated as described.

258. Paddle-wheel; Nathan Thompson, Bridgeport, Connecticut.

Claim—The arrangement and combination, in the manner described, of the triangular floats with the arms to prevent the formation of the vacuum, the lifting of back water, &c.

259. Method of Securing Bits in the Stock; Wm. Tucker, Blackstone, Massachusetts.

Claim—The application or arrangement of the screws and the segmental button with respect to the bit or boring tool socket, and to operate with or on the tool, as specified.

260. Carpet Fastener; C. F. Spencer, Rochester, New York.

Claim—A carpet fastener made of a single piece of plate metal of a triangular or three-pointed form, one point serving as the shank to be driven into the floor, another point as the hook for receiving the carpet, and the third point as a head so shaped as to enable the fastener to be driven with facility into the floor.

261. Shingle Machine; W. P. Valentine, Fond du Lac, Wisconsin.

Claim—1st, Varying the rate of feed by the mechanical means set forth, so as to feed the lumber to the saw more rapidly during the first half of a cut, when the saw has the highest velocity, and slower during the latter half of a cut, in order to keep the saw constantly at a uniform velocity. 2d, The use of the two carriages, operating in the particular manner described, for the purpose of cutting alternately on both sides of the saw, thus keeping the saw constantly at work, and preventing the loss of time or power whilst the lumber is returning with the carriage to be ready for the next cut. 3d, I do not claim the concavo-convex saw, or the planes upon its surface, as separate mechanical devices; but, I claim the concave saw and the planes, in combination with the saw carriage for giving rake to the saw, and for sawing and planing shingles at a single operation. 4th, The arrangement of springs, the head blocks, and the spreaders, for alternately holding and dropping the shingle block.

262. Machine for Heading Bolts; B. C. Vanduzen, Cincinnati, Ohio.

Claim—The arrangement and combination of the adjustable spring fork rod, lever, upper lever, and heading die, as described, for the purpose of regulating the movements of the lever and die, and controlling the size given to the head of the bolt.

263. Odometer; Haskel Walker, Hartford, Assignor to self and B. P. Driggs, Fairlee, Vermont.

Claim—The peculiar arrangement of the parts thereof, by which an actuating tooth upon the hub of one of the wheels of a carriage will cause each revolution of said wheel to unerringly impart a small portion of a revolution to the shaft of the odometer, whilst the spring, by its action against the faces of the angular portion of said shaft, will accurately govern and control the movements thereof.

264. Construction of Saw Teeth; W. A. Wilson, Berlin Falls, New Hampshire.

Claim—Combining the planing with the sawing tooth, so that the cutting edge of the former shall be in rear of, and at about right angles to, the back of the latter, having the throat between, as set forth.

265. Brick Machine; William Wood, Hartford, Connecticut.

Claim—The arms, in combination with the slides, provided with the lever and tappet for operating the moulds, as described.

266. Pot-hole Covers for Cooking Stoves; L. E. Clow, Assignor to C. H. Ramson & Co., Albany, New York.

Claim—A cover or division plate, constructed of two perforated plates and the unperforated rim or ring, as set forth.

267. Iron Railroad Cars; Joseph Davenport, Assignor to self and C. M. Russell, Masillon, Ohio.

Claim—The combination with the platform or bottom of a railroad car, of a laterally and longitudinally supporting truss brace, when said brace consists of a four-sided frame, a series of transverse ties, and transverse diagonal braces, a central longitudinal skeleton or diagonally braced girder, and bearing plates or shoes, as set forth.

268. Mole Plough; W. P. Goolman, Assignor to self, S. B. Morris, and W. Hollingsworth, Dublin, Indiana.

Claim—The arrangement of devices for producing or preventing lateral curves in a drain by adjusting the presentation of the mole independently of the point of a draft.

269. Water-closet; Darius Wellington, Assignor to C. A. Wellington, Boston, Massachusetts.

Claim—The arrangement and combination of the hollow valve rod perforated at d d, cap, basin, pipe, tube, and reservoir, as described.

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270. Railroad Car Trucks; T. F. Allen, Dyersville, Iowa.

Claim—A car truck, sustaining the weight of the car body upon the centre, in a manner to balance or keep it in equilibrium, and free from contact with the side timbers of the truck frame, whatever be the motion imparted to it, and yet provide but the one common axis or bearing for it to turn upon.

271. Apparatus for Destructive Distillation; Luther Atwood, Brooklyn, New York.

Claim—The combination of the vertical distilling tower, and appurtenances, with the condenser and the adjustable draft passage, or their equivalents, in combination, when arranged so as to use the current of heated products of combustion in its upward or natural direction.

272. Hop Frames; Thomas D. Aylsworth, Ilion, New York.

Claim—So hanging the main wire upon the supports, as that said supports will prevent the wire from slipping through them, should it accidentally become loose or broken. Also, in combination with the main wire, suspended as represented, the uniting thereto of the training wires by spring hooks.

273. Farm Gate; George W. Baker, Neponset, Illinois.

Claim—The slide and levers, c c, in combination with the rods, f f, levers, l l, rods, c c, and bars, arranged in connexion with the gate sections, as set forth.

274. Cushion for Billiard Tables; Abraham Bassford, City of New York.

Claim—Constructing the cushion of a billiard table of a metal plate, the edge of which is protected by a thin strip of india rubber, or other suitable substance.

275. Cushion Rail for Billiard Tables; Abraham Bassford, City of New York.

Claim—1st, The arrangement of the cushion rail of a billiard table, in such a manner that a space is left between the bed and the rail, by securing the same to the bed by means of studs and bolts. 2d, The arrangement of the pocket bows, which are made of one piece with the rails, and secured together by a lap-joint, and which are beveled down at their lower edge.

276. Hinge for the Reflectors of Stereoscopes, &c.; Alex. Becker, City of New York.

Claim—The arrangement of the ears, one on each side of the reflector of a stereoscopic case, or attached in a corresponding manner and for the same purpose to any like part of another similar instrument, in combination with the screw.

277. Mode of Preparing and Mounting Slates; Hubbard Beebe, New Haven, Connecticut.

Claim—The combination of a metallic band or rim and vulcanized india rubber frame or mounting, with or without a lining of cloth, to the school slate, whether of stone, slated paper, or wood. Also, the application of the vulcanized india rubber or gutta-percha frame or mounting, substantially in the manner described, without the metallic rim, to slates of stone or other material of sufficient strength and stiffness to warrant its disuse in any case; but I deem it preferable, in all cases, to combine the two, where durability as well as noiselessness are deemed important.

278. Mode of Fastening Skates; Edward Behr, City of New York.

Claim—The arrangement of the screws, b, and the screws, i, or their equivalent, in combination with the toe-cap and with the heel-strap.

279. Mole Plough; Joel Carrington, Avoca, New York.

Claim—The combination and arrangement of a replaceable pointed coulter with a continuous plate or solid standard carrying the mole, and a brace in the rear, connecting the said mole to the beam, and also to the handles.

280. Method of Opening and Closing Gates by Weight of Vehicle; Frederic B. Betts, Brownhelm, Ohio.

Claim—The combination of the roller and its appurtenances with the levers and connecting rods, and with the gate, for the purpose specified.

281. Construction of Mallets; Lyman W. Blanchard, Whittingham, Vermont.

Claim—The mode of constructing mallets with wooden head blocks and iron flauches, and a tapering screw.

282. Carriage Tops; Pardon Boyden, Sandy Creek, New York.

Claim—The arrangement and combination of the bows, E, bars, D D, bars, H H, and seat rail, as described.

[The top of a calash, by this invention, is constructed without folding bows, the frame of the top being perfectly rigid and affixed to centres by means of a single radius bar at each side of the seat or vehicle.]

283. Fastening Skates; John Charlton, Newark, New Jersey.

Claim—The arrangement of the self-adjusting toe-cap, which is attached to the stock of the skate, as specified.

[In the front part of this skate a cap is placed which can be adjusted, by means of slides, to the size of different feet. It is drawn up to the toes by the straps that serve to fasten the skates to the feet.]

284. Billiard Table Cushions; Hugh W. Collender, City of New York.

Claim—Making cushions for billiard tables of what is known as the soft compound of vulcanized india rubber, faced with what is known as the hard compound of vulcanizable india rubber or allied gum, united in the green or plastic state, and together subjected to the heating process for vulcanization.

285. Submarine Telegraph Cable; James M. Connel, Newark, Ohio.

Claim—The introduction of the smooth surfaced wrapping between the coil and the insulating covering, and the employment of this last covering as a core for other wires.

286. Cheese-presses; Samuel Cope, Enterprise, Illinois.

Claim—Graduating the force of a hydrostatic cheese-press by drawing the water slowly through the stop-cock, as described.

287. Apparatus for Sounding House Bells, &c.; Joseph Cordnan, Brooklyn, New York.

Claim—The arrangement of the three separate springs, in combination with the two tubes and escapement bolt, as described.

288. Pile-driver; Waldo P. Craig, Newport, Kentucky.

Claim—1st, The application and arrangement of the guides attached to their upper ends by universal joints to the frame, and at their lower ends, sliding in apertures in a collar adapted to fit over the end of a pile, and follow the same in its descent. 2d, In combination with the above, the turn-table, constructed as set forth.

289. Sawing Machine; Wm. H. Crittenden, Grafton, Ohio.

Claim—The manner of arranging the compensating levers and rods, in combination with the straining levers, straining rod, adjustable slotted holder, and saw, arranged in the manner set forth.

290. Chopping-block for Stave Machines; A. H. Crozier and Cyrus Carrier, Oswego, New York..

Claim—The grooved metallic chopping-block, constructed as described.

291. Seeding Machines; F. M. Davis, Footville, Wisconsin.

Claim—The arrangement and combination of the caster wheel. lever, spring rack bar, pinion bar, pinion, rod, slide, and share, as described, so that when the bar is thrown back and lever is depressed, the bar will carry the pinion out of gear with wheel, and thus render the seed slides inoperative, while the front part of the machine will be lifted on the caster-wheel, and the share raised out of the ground.

292. Pick Handle; James E. Emerson, Sacramento, California.

Claim—The iron heading of a handle fitted to the under side of a pick, or other instrument, by means of a pin and hole on corresponding plane surfaces, or a swelling and hollow, corresponding to each other, and securely fastened thereto by means of a stirrup extending over the pick, or other instrument, and secured to the handle by means of a key and wedge, which will, by such combination, form a durable and permanent mode of fastening handles on picks, or other instruments, without eyes therein.

293. Bedstead Fastening; Elisha E. Everett, Philadelphia, Pennsylvania.

Claim—A plug fastening, consisting of the two plug pieces, arranged in combination with the post and rail of a bedstead, in the manner specified.

294. Tanning Hides and Skins; Thomas Fergusson, City of New York; patented in France, Aug. 10, 1858.

Claim—The method described of impregnating hides or skins with the required liquid, by subjecting them to the action of a current of the liquid under a sustained and regulated pressure, after they have been deprived of air by a preliminary exhaustion.

295. Stoves; Francis Gilliland, Port Jackson, New York.

Claim—In combination with the lining and sheet metal case, the cylinder, placed within the body of the stove, and provided at its top with the register or sliding band, and a register or slide on its flanch.

296. Tool for Cutting Metal; L. F. Goodyear, New Haven, Connecticut.

Claim—The arrangement and combination of the adjustable wedges, cutters, and ring, as described.

297. Gridirons; Wm. A. Green and John G. Treadwell, Albany, New York.

Claim—The check-plate attached to a stove gridiron, when the same is constructed in the manner set forth.

298. Machines for Pegging Boots and Shoes; Alpheus C. Gallahue, North East Centre, New York.

Claim—1st, Forming the rack bar of two parts, arranged so as to be lengthened and shortened, to compensate for different length of shoes. 2d, The adjustable or swinging plate, in connexion with the inclined planes, or an equivalent device, for actuating the plate. 3d, The inclined peg gauge in connexion with the peg or feed-box, so as to gauge the pegs from their lower ends. 4th, The vibrating socket in connexion with the plunger rods, arranged in the same slide bar. 5th, The bar, provided with the shoulder or bearing, and rendered capable of being operated, when necessary, by the adjustable yoke and cam, for the purpose of duplicating the row of pegs when required. 6th, The combination of the swinging bed-plate with a rack, arranged as set forth.

299. Revolving Retorts for Distilling Coal Oil; James Gillespie, Freeport, Pennsylvania.

Claim—Securing the hopper-like cup in position by means of the pins, or their equivalents, surrounding the exit journal of each retort, the square-headed shaft passing through a hollow journal at the opposite end of the retort, and the external plate, as described.

300. Protractor; Charles Gordon, Washington City, D. C.

Claim—The base, the meridian limb, the vernier, the arc, and rulers, with the clamping screw, arranged as specified.

301. Metallic Pen-holder; Albert Granger, City of New York.

Claim—The holding of a pen on the outside of a metallic tube (commonly called a pen-holder,) in such a manner, by reason of pierces, cracks, and indentations, as to leave the entire length of a pen, when inserted in proper writing position, uncovered.

302. Hose Coupling; Smith Groom, Troy, New York.

Claim—The arrangement of the notched lugs and wedge-shaped flanches, for conjoint operation upon the outside of the fixed part and movable ring of the two halves of the coupling. And in combination with the lugs and flanches arranged upon the coupling for conjoint operation, I also claim the ratchet teeth and catch, when arranged upon the two halves of the coupling, as described.

303. Ploughs; Wm. J. Griffies, Marietta, Georgia.

Claim—The arrangement of the stock, forked and slotted foot, screw, shovel, brace, wedge, beam, and handles, constructed as set forth.

304. Watchmakers' Lathes; Elijah Harris, Princeton, Illinois.

Claim—The standard, F, with rimmer, the standard shown at fig. 3, and the standard shown at fig. 4, with dovetail slide, the extra slide head, in combination with the standards and the slide tongs, as described.

305. Corn Planters; Jacob Haynes, Cameron, Illinois.

Claim—The hinged shoe formed with a serrated plate and with the wings, in the manner described. Also, the combination of the movable seat with and supported by the hinged radius bars, and by the sliding bars, for the purpose of enabling the driver to raise or lower the front end of the machine, in the manner described.

306. Rocker-boxes for Saw Shafts; Rufus S. Lee and Wm. D. Leavitt, Cincinnati, Ohio.

Claim—So connecting the inner to the outer box through the medium of a spring, as that said inner box or bearing may have end motion in the outer one against the action of said spring, as described. Also, in combination with the elastic or spring connexion between the inner and outer box, the rollers for the inner box to move on.

307. Grinding Mills; Francis M. Hemphill, Newport, Kentucky.

Claim—1st, In combination with an adjustable bridge tree, the spindle, confined below to the tree and hinged above to the cup-formed, driving, and feeding ryne, having a hinged attachment to the runner, and enabling a discretionary increase of the stress of the runner on the grain by the lighter screw operating wholly from below. 2d, The described arrangement of the cup-formed driving and feeding ryne, gudgeons, bolts, sleeves, and metallic eye, having the described connexion with a runner and spindle respectively. 3d, The cup-formed, driving, and feeding ryne, having the described or equivalent hinged attachments to the spindle and the runner respectively, and operating as set forth. 4th, The frame, A B C, constructed as set forth.

308. Insulator for Lightning Rods; Russel Hickok, Fort Edward, New York.

Claim—A lightning rod insulator made in one piece, so as to support and insulate the rod, and also leave open spaces for water to pass through it, and for air, when suddenly expanded, to escape from within it.

309. Churn; Gardner P. Hopkins, Cabot, Vermont.

Claim—The construction of the churn so as to combine the rotary motion of the barrel with the up-and-down and rotary motion of the dashers, and so to prevent the cream from acquiring a circular motion in the process of churning.

310. Making Moulds for Casting; Robert Jobson, Wordsley, England; patented in England, May 3, 1856.

Claim—Constructing the table platform or bed, so that it may turn on or about necks or axes, as described.

311. Harvesters; Henry R. Keese, Bridport, Vermont.

Claim—1st, The employment of a hinged supplemental frame, in combination with the main frame and driving wheel, when the said frame is provided with an adjustable bearing wheel, or its equivalent. 2d, The combination of a driver's seat with the supplemental frame and driving wheel, so that, by lateral change of his position, the driver may elevate or depress the cutters or diminish the traction, and otherwise balance and govern the machine. 3d, Hinging the supplemental frame to the main frame, as set forth.

312. Breech Loading Fire Arms; Edw. Lindner, City of New York.

Claim—1st, The method described for operating or closing the breech, and forming a tight joint at the junction of the barrel with the breech, by the employment of a screw ferule or sleeve, fitting an outer screw thread on the barrel, and provided with a projecting annular flanch for grasping and releasing the breech, and for drawing the same backwards and forwards in the direction of the barrel, to or from the rear end thereof, upon said screw-threaded sleeve. 2d, In combination with a movable box within the breech, constructed as described, the packing thereof by means of asbestos, or its equivalent. 3d, Locking the screw-threaded sleeve that operates the breech, by forming the pivoted lever which serves to turn said sleeve with an eccentric or cam, arranged to act upon a locking pin by pressing down said lever after the breech is drawn tight, as set forth.

313. Portable Writing Desks; Wm. H. Lochman, York, Pennsylvania.

Claim—The mode and manner of uniting the different parts of a writing desk by hinges, or their equivalent, so as to admit of its being folded up into a comparatively small space.

314. Life-boat; Matthias Ludlam, Fair Haven, Vermont.

Claim—Providing the exterior of the boat with adjustable side-floats, constructed and hung, or arranged to operate in, or at different fixed positions or distances, to or from the sides of the boat. Also, providing either float, arranged along the outsides of a boat, with an open or trellis-work railing made to project below the float.

315. Expanding Auger; Charles Meyer, Fond du Lac, Wisconsin.

Claim—An expanding auger, constructed and operated substantially as described.

316. Corn Planters; John G Mitchell, Collington, Maryland.

Claim—The combination of the swinging hopper, constructed and arranged as described, with the adjustable coverer and dropping tubes.

317. Harvesters; J. A. Moore and A. H. Patch, Louisville, Kentucky.

Claim—1st, The enlargement of the curved slots of the standards, as set forth. 2d, The arrangement relatively to each other of the vertically perforated curved stop bar, slide, and lever, for the purpose set forth.

318. Preserve Cans; Samuel Morritt, West Pennsboro', Pennsylvania.

Claim—The covering of fruit cans by means of the concave cover, when the same is constructed as described, and retained in place solely by atmospheric pressure.

319. Apparatus for Cleansing Bristles; Henry W. Mosher and Joseph A. Conboie, City of New York.

Claim—The rotating bristle clamps placed within a cylindrical box or case provided with diagonal plates, and used with or without the brush and soap bar, or other cleansing substance, as set forth.

320. Hay Mangers; John Packer, Philadelphia, Pennsylvania.

Claim—Combining with a hay manger a falling rack, to prevent the horses from pulling out and unnecessarily wasting the hay therein.

321. Ventilating Vault Cover; John Patrick, City of New York.

Claim—The perforated plate and gutter, in combination with the metallic roof, ceiling, or walk, for forming a ventilating space and catching any water of condensation, in the manner specified. And, in combination therewith, the ventilating pipe, as specified.

322. Machine for Bending Tire; Wm. Patterson, Constantine, Michigan.

Claim—1st, Connecting the clevis to the lever and segment in such a manner that the lever will cause the clevis to grasp and release its hold on the bar to be bent, independently of and before said segment commences to move. 2d, Providing the outer end of the clevis with an arm, so arranged in relation to the circumference of the segment as to bear against the outer side of the tire, and support it (while being bent) above the end of the segment, thereby preserving the circle of the tire by preventing it from springing back during the descent of the lever. 3d, Making the clevis adjustable for the purpose of adapting it to the use of different sized segments in the same machine.

323. Hoop Machine; Henry C. Peirson, Philadelphia, Pennsylvania.

Claim—The arrangement of the series of bending rollers, or their equivalents, in rear of the cutter, or its equivalent, so as to operate upon the hoops in the manner specified, as the said hoops pass between them directly from the said cutter.

324. Railroad Coupling Chair; R. S. Potter, Chicago, Illinois.

Claim—The use of two wedges or keys, in combination with a railroad chair, when the outer lip of said chair is overhung in the manner described, and its inner surface is of a conoidal form, as specified.

325. Seed Planters; D. R. Prindle, Bethany, New York.

Claim—1st, Hinging the frame that carries the seeding devices, and the beams that carry the furrow opener and coverer to the axle. Also, in combination with the axle and hinged frame and beams, the tongue and lever, for raising and lowering or controlling the planting and covering devices. Also, the adjustable hinged clevis irons, arranged as set forth. Also, the combination of the curved spring plates and spring, as applied to the seeding wheels or cylinders, for the purpose explained.

326. Cloth Frames; Daniel Read, Hamilton, New York.

Claim—The combination and arrangement of the standard with the arms, the standard, i i, and braces, as specified.

327. Machinery for Filling Loom Harness Needles; L. L. Reynolds, Manchester, New Hampshire.

Claim—The hooks, or the equivalent thereof, for depositing the twine or cord upon the outer sides of the score of the needle, when combined with a device for delivering the twine or cord to said hooks. Also, in combination of the intermittent rotating oval-shaped pin with the cam, or their equivalents, for depositing the twine or cord evenly around the end of the needle.

MECHANICS, PHYSICS, AND CHEMISTRY.

*On a Universal Printing Press.** By T. J. Silberman, Jr.

A press on this principle, and adapted to all kinds of printing, has been patented by Mr. Silberman, pupil and assistant in physics to the late M. Savart, and to M. V. Regnault, at the College of France.

Pascal's law is this: "Whatever be the amount of pressure brought to bear upon any point in a contained fluid mass (whether the fluid be a liquid, or steam, or gas), this pressure is distributed with perfect and entire equality among all parts of the mass, and consequently with perfect equality over all parts of the surface of the vessel which contains the mass;" so that if this vessel or a portion of it be pliable and elastic, it will communicate the same pressure which it receives to paper, cloth, or any other similar substance, laid upon an unyielding engraved surface. And the invention consists in printing by thus applying the pressure of a fluid to a yielding surface laid against an unyielding engraved surface; and this whether the surface printed be that of the vessel itself, which thus becomes the press,—or whether it be communicated to another interposed yielding surface from the pliable and elastic side of the vessel, so as to print plane, curved, or angular surfaces,—or whether the material to be printed be paper, felt, textile fabric, caoutchouc, leather, bladder, ceramic paste, or glass, crystal, or enamel softened by heat,—or whether it be used for the purpose of peripheric printing, as in the printing of terrestrial and celestial globes, of vessels of glass and earthenware,—or as a modification of the presses in use for other kinds of printing.

* From the London Civ. Eng. and Arch. Jour., December, 1858.

The application of this principle to the peripheric printing of globes, and of vessels of glass and earthenware, is the subject of a separate paper. At present let us consider merely its application to printing upon plane surfaces, as well as the different modifications it admits of, so as to suit the different kinds of printing; and lastly, of its peculiar advantages over other methods.

The following are some of the methods in use for the practical application of the principle:

1. A strong shallow basin of tough metal is required, with a triple stop-cock at bottom, admitting at pleasure the sort of fluid intended to be used, whether it be atmospheric air, steam, or (when great pressure is required) water, with hydraulic pressure. This basin is filled with water, and covered by a tympan formed of a sheet, or of several sheets thick, of caoutchouc firmly clasped at the edges in an iron frame. A movable plate of iron strengthened by stays is attached by strong hinges to one of the edges of the tympan frame. This plate, when shut down upon the surface of the tympan, forms the unyielding portion of the press, and supports the engraved plate against the substance intended to be printed, which receives by means of the tympan the pressure produced upon the water at the bottom of the basin.

In order to retain this plate firmly in its place upon the tympan, its edges as well as those of the basin should be beveled in such a manner as to lock the whole way round in a collar with a corresponding groove; this collar opens and closes upon the edges the whole way round by means of two hinges and wide-threaded strong screws, or else by means of a cam or eccentric lever lock. A very simple contrivance compels regularity in the proceeding, and prevents accidents, by locking the stop-cock, and preventing the admission of pressure into the basin, until after the plate shall have been shut down and firmly locked upon the tympan.

The engraved plate may either be permanently fastened upon the iron plate, or it may be run into its place in a groove, so as to admit of being easily removed and replaced after each impression, as in the case of copperplate printing.

When it is intended to print paperhangings or cloth with dies, an iron frame instead of the solid plate above described is attached to the hinges; a strong iron axle passing through gudgeons on opposite sides of the frame carries a panel fitting into the frame, and upon this panel the die is fixed. The panel thus revolving completely on the axle at the same time that the frame is raised upon its hinges to a vertical position, admits of the face of the die being alternately brought in contact with the tub, when it is charged with color, and with the surface of the material intended to be printed.

2. Another form of the press is one in which the tympan is movable upon hinges, and fastens down upon the plate, which in this case is the fixed part of the press, and upon it the die is laid. In lithography or typography there must of course be a hollow in the plate corresponding to the thickness of the stone or type used.

This was the form adopted for the first experiment with the press,

its tympan consisted of two sheets of vulcanized caoutchouc fastened to the basin, and secured by strong screws; the tympanum and the plate, instead of being locked together while the pressure was on by means of the collar above described, were kept together at one end by the hinges, and at the other by a cam or eccentric lever lock, working from an iron arch like a common letter-copying machine, and to which two movable claws are attached, which, when the lever is worked, grasp and secure the ends of a strong bar across the centre.

3. It may sometimes be desirable to place the press vertically, notwithstanding the slight, and in fact almost imperceptible difference in the pressure at the top and at the bottom of the basin, and which is produced by the column of water in the basin itself. When air is used this inequality is absolutely imperceptible, but on account of the great compressibility of air a much larger quantity of air must be admitted than when water is used; for instance, if the basin is one metre square and one millimetre deep, and consequently holds one litre, it will require one litre of air to produce a pressure of a single atmosphere, and ten litres to produce a pressure of ten atmospheres.

The vertical position is particularly well suited for very large plates, say five or six feet square; the copperplate can if necessary be heated from behind, and the workman can apply the ink in a standing posture. The press in this case would open like a door, and large presses thus arranged would occupy but little space, would be easily worked, would render the application of the ink less fatiguing, and would save rent in office space, for six vertical presses take no more room than two horizontal presses. In this way the printing of very large maps will become not only possible but cheap.

As to the purposes to which it can be applied:—1. It is equally suitable to all kinds of ordinary printing, whether copperplate, lithography, typography, paperhangings, or wood engraving, for it fully admits of the depth of shade in certain parts of the engraving being modified according to taste, without altering the engraving by the usual contrivance of folds of paper cut out so as to throw the part into suitable relief. 2. It is peculiarly suitable for polychromic printing, whether typographic, lithographic, or copperplate, and the pressure being only in a vertical direction, the paper or cloth is not liable to be altered in size or form by the pressure, and admits of accurate fitting to the guide pins as often as the number of colors used may require. 3. It is equally suitable for printing upon all sorts of material, whether paper, cloth, ceramic paste, felt, leather, or caoutchouc. 4. It prints with a single impression very much larger plates than it has heretofore been possible to do, and it ensures the color being uniform over the whole surface. 5. It admits of being used for stereotype and other casts from ordinary printing type, and does not require that frequent touching with the brush which wears away the characters so quickly.

As to the pressure:—1. The pressure being that of a fluid communicated through a uniformly yielding surface, will be absolutely equal at every point of the surface, consequently there will be no danger of partial pressure on the plate, nor need there be a pressure upon any

part of the plate beyond what is necessary, so that the maximum result is thus obtainable with a minimum of pressure. 2. Any amount of pressure required can be easily obtained. 3. The amount of pressure can be ascertained with precision (for instance, by Bourdon's metallic manometer), and diminished or increased to the exact extent which may be required. 4. Perfectly plane surfaces are no longer the only surfaces capable of being printed. 5. Convex or concave surfaces can thus be printed.

As to make, form, and size:—1. The press is extremely simple in its construction; almost all the pieces are cast exactly as they are used, and require very little fitting. 2. It can be made of any strength required. 3. It requires no troublesome alterations when the purpose for which it is used is altered. 4. It fits in a very small space, being only four or five inches wider than the printed sheet, whereas the presses hitherto in use are at least four times wider than the printed sheet. 5. It thus admits of being worked in a small and comparatively inexpensive office. 6. Its size being so small, a printer can have several presses of different sizes in his office, so as to be no longer forced to use his large presses for small sheets. 7. It is easily taken asunder and moved. 8. It is on this last account, and the almost impossibility of breakage, admirably adapted for exportation.

As to its working:—1. It requires hardly any effort, and entirely dispenses with the severe labor which the winches and pedals of the present lithographic press requires,—with the rolling of copperplate printing,—with the difficulty of charging the blocks with color, as well as with the danger of working the huge lever of the ordinary press in printing paperhangings; and as it requires less exertion on the part of the workmen, it gives them more time to attend to the quality of the work, and thus tends to elevate their character. 2. A much greater number of impressions can be taken in a given time than was possible heretofore. 3. The manner of using the press can be learned in an hour. 4. No modification of the press, or any of its parts, is necessary when a change is made in the size of the sheet, or otherwise in the nature of the work to be printed. 5. The impression is uniformly even and invariably successful. 6. There is no longer any danger of distorting nor of lengthening by rolling out the plates in copperplate printing,—nor of breaking the lithographic stones by the uneven pressure of the scraper. 7. The simplicity of the contrivance for locking the press, and for admitting and shutting off the pressure, renders all mistakes impossible. 8. There is no part of the press which is expensive from excessive wear and tear; and even when worn out, both the caoutchouc and the metal have a considerable value as raw material.

As an investment, the great simplicity of the machinery, and the small expense of fitting, will allow the press to be sold extremely cheap.

As to the sort of pressure to be used,—steam pressure may be adopted, or the pressure of expanded or condensed air, the hydraulic press, the screw, the cam, or the eccentric or knee lever lock. If steam is used, the waste heat will warm the plates in copperplate printing,

and will thus get rid of the charcoal dust, so injurious to the health of the workmen.

The expenditure of water or steam may be estimated by considering the surface of the caoutchouc as the surface of a piston, and its depression joined to that of the printed surface as the stroke of the piston; consequently, when the basin is one metre square, there is an expenditure of one litre of air or water for each millimetre in the depression of the surface.

Water appears on the whole the most desirable agent, on account of its non-compressibility and of the small quantity required in order to produce very considerable pressure, as also on account of its non-expansibility, which prevents the possibility of an explosion, for if any breakage takes place the water simply runs out. In experiments which were made with a pressure of from 20 to 30 atmospheres, before perfecting the press, the vessel repeatedly burst with no greater injury to those engaged than a few splashes on their clothes.

Coloring Matters.

In view of the excitement which has recently ensued upon some reported cases of accidental poisoning from the use of arsenical colors on stuffs and paper-hangings, M. Salvetat calls attention to the possibility of producing cheap and permanent greens, pinks, and violets from common metals. He enumerates the following:

Chrome-greens—Prepared by calcining together the sesqui-oxide of chromium, hydrated alumina, and the carbonate of cobalt in an oxidizing atmosphere. The proportions vary with the color desired. Blues may also be obtained in the same way.

Hydrated Oxide of Chrome.—This magnificent color has long been used by the painters under the name of *emerald green.* It is also sometimes called *Pannetier-green*, from the name of its introducer. The following mode of preparing it has been patented in France by M. Guignet:—Calcine, carefully, to redness a mixture of bi-chromate of potassa and crystallized boracic acid; a green mass is obtained which is a borate of chromium and potassa. In contact with water this salt decomposes; boracic acid dissolves, and the hydrated oxide of chrome remains precipitated. The proportions recommended are 10 parts by weight of the crystallized acid ($BO^3 \cdot 3HO$,) to 3 parts of bichromate $KO \cdot 2C \cdot Or^3$, which by theory should give 2 parts by weight of the hydrated oxide.

The tone of the color may be varied by the mixture of alumina. The tone of the emerald green corresponds to green 4, 12th tone of the 1st chromatic circle of M. Chevreul.

Cobalt-Pink, and-Violet.—When a solution of a cobalt-salt is precipitated by the phosphate of soda, we obtain a pink-salt of a very beautiful tint, which, when simply dried in the air, corresponds to 1st red-violet, 5th tone of the 1st chromatic circle of M. Chevreul. It is known that under the influence of heat the oxide of iron takes a tint

which varies from orange to blue-violet, according to the temperature to which it has been exposed. The phosphate of cobalt presents a similar property; and according to the temperature to which it has been exposed, its tone varies from red-violet to the 2d blue-violet. We may thus obtain any intermediate tint from the 3d violet-blue to the 5th violet and red-violet. The violet, 11th tone, corresponds to the fused phosphate of cobalt. The 4th violet-blue, 10th tone, corresponds to the aluminate of cobalt and chrome. These tints will be purer in proportion as the heat has been uniform throughout the whole mass.

As the oxide of cobalt may now be obtained at a reasonable price, it is to be hoped that these new mineral colors may be serviceable for printing on stuffs and paper, and especially for the preparation of fine colors for painters.

Nickel-yellow.—The phosphate of nickel, which, when merely dried at ordinary temperatures, is of a greenish-white color, becomes yellow by exposure to a red heat. This may give us a new fixed yellow for similar purposes.—*Academy of Sciences of Paris, Feb.* 7, 1859.

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*On an Expanding Pulley for Obtaining Variations in the Speed of Machines with facility.** By James Combe, Belfast.

A pretty correct idea of this pulley may be formed by supposing two cones cut with radial spaces alternating with solid parts, so that the solid parts in one may slide freely into corresponding spaces in the other, in the direction of a common axis. The sizes of these radial sections are regulated so that when the two cones are put together they form a grooved or V pulley, the diameter of which varies according to the position which the cones occupy with regard to each other. This will be at once apparent by an inspection of the engravings. It will also be seen that any desired amount of variation in size may be got, and this without involving the necessity of occupying a large space. This change in size is made by pressing the one into the other, which can easily be done whether the pulley be in motion or at rest. The value of the property of giving readily any amount of change in size will be made evident by a comparison of the results obtainable by a pair of common cones and a pair of expanders of similar dimensions, and giving the same extremes of speeds.

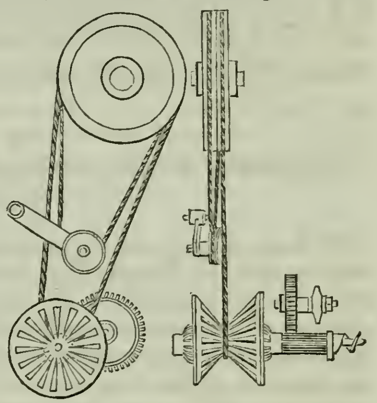
A range from 1 to 4 in diameter (or more if necessary,) is easily obtainable in the expanders, and, supposing the one which drives to have a speed of 80 revolutions per minute, and that it be set at 4 ins. diameter, and the one which is driven to be set at 16 inches diameter (the corresponding position), the speed of the latter will be one-fourth of 80, or 20 revolutions per minute.

When the driver is changed to 16 inches in diameter, and the driven to 4 inches, the speed of the driven shaft will be increased to 320 revolutions per minute.

The changes between these extremes (20 and 320,) may be of any

* From the London Mechanics' Magazine, October, 1858.

extent or per centage on the speed, and they can be made as gradually as is desired without stopping. For comparison with this, take a pair of common cones, having the same extreme diameters, and having steps of two inches, which is not more than usual. When the driving strap is changed from the steps on the cones which give the slowest speed (that is, 20 revolutions per minute) to the next steps, which is the smallest change that can be made, the speed of the driven is increased to 34 revolutions per minute, that is, 70 per cent. on the former speed. The change to the next steps makes the speed of the driven 53, and the increase here is 56 per cent. The third change increases it to 80, or 51 per cent.; the next to 120, an increase of 50 per cent.; then to 186, by an increase of 55 per cent.; and, lastly, to 320, by an increase of 72 per cent. All these changes in speed are great, and, although in practice mechanics have become accustomed to them, and don't think of the loss, it is quite clear that a great waste of time must result from not being able to get smaller changes readily. For instance, suppose that a lathe or boring machine has a piece of work in it of a diameter that would require a speed between any of the speeds which the steps of the common cones give, but which will not bear the whole step; it is quite clear that in this case a loss of time and work equal to 50 or 60 per cent. may take place. To get over the difficulty attending the use of common cones, some tool-makers use two pairs of driving pulleys on the counter shaft, which of course doubles the range of the cones; but this is a cumbrous arrangement, and is still very far from giving what is necessary or desirable. There are many machines in which a variation of speed is desirable, and would be used if it could be got readily; but there is often such a loss of time involved in making a change that very much slower speeds are used rather than take the trouble or incur the delay of making that change. The common cones referred to are not by any means an extreme case; on the contrary, it is quite common to make the steps even greater, and, if the number of steps be less and the extent of the range smaller, there is of course a corresponding diminution in the adaptability of the machine to different purposes.



The expanding pulley was first brought out for the purpose of giving the varying motion to the bobbins in flax and tow roving frames, to which it is applicable with great advantages, from the accuracy of its action and the small space which it occupies. By its use a very simple and correctly working machine is got, capable of making bobbins either in the ordinary way or in cops. It is equally applicable to the heaviest and the lightest frames.

The cop is from a tow roving frame, and is made of rove weighing

1 lea (or 300 yards) to the lb. The bobbin is filled with flax rove of 40 leas (or 12,000 yards) to the lb.

On the machines on which this bobbin and cop were filled only one expander is used, and the band is kept at the necessary tension either by making the expander swing in a frame or by the use of a stretching pulley.

A very simple mode of applying a stretching pulley is to make the pulley, which does not vary, with two grooves or V's, and pass the band twice round it, putting the expander in one fold, and the stretching pulley in the other. These arrangements are applicable to many other purposes. Where two expanders are used, one to drive the other, it is not necessary to have any stretching pulley, but simply to connect one or both sides of each pulley with levers, so that they may be moved simultaneously as required.—*British Association*, 1858.

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*Electro-zinc Deposits on Engraved Copperplates.** By Henry Bradbury.

M. Louis Figuier, of Paris, through the instrumentality of my friend and *confrére* M. Henri Plon, the eminent printer and publisher of Paris, having recently, in the columns of *La Presse* newspaper, made mention of my mode of surfacing engraved copperplates with a coating of pure zinc by electro-metallurgical means, for the purpose of protecting such plates from wear while printing, and which coating can be removed and renewed at pleasure with facility, and without injury to the engraved plate, I beg leave to introduce the particulars of my mode, for the benefit of those interested in extending the application of the galvano-plastic art.

To obtain a deposit of pure zinc capable of printing from 1500 to 2000 impressions, or more, before requiring to be removed and renewed, I have recourse to a combined solution of chloride and cyanide of zinc, prepared as follows:—

Chloride of Zinc Solution.—In a suitable vessel dissolve one part chloride of ammonium in eight parts water; place in this a porous cell containing the same solution and a copperplate, which attach to the zinc of a Smee's battery, and in the outer cell place a plate of spelter, which attach to the silver of the above battery for 48 hours.

Cyanide of Zinc Solution.—Dissolve ½lb. of cyanide of potassium in twelve parts of water; then add as much chloride of zinc as the solution will take up.

Mix these solutions together in equal parts; use a zinc positive pole and one of Smee's compound batteries, intensity arrangement, charged with one part of sulphuric acid to twelve of water.

In from 45 minutes to an hour a deposit of the most beautiful lustre will be obtained, capable of yielding from 1500 to 2000 impressions, and even more, according to the experience of the manipulator.

Whitefriars, February 3, 1859.

* From the Journal of the Society of Arts, No 324.

*Electro-zinc Deposits on Engraved Copperplates.** By F. Joubert.

Your last number contains a letter from Mr. Henry Bradbury, describing a process for covering an engraved copperplate with a deposit of zinc, in order to protect it from wear while being printed, and it is stated such a deposit will yield from 1500 to 2000 impressions.

This is an imitation of the process for covering engraved copperplates with iron before sending them to press, originally introduced in Paris under the name of "Acierage," for which I hold an English patent, taken out last year, and which process I had the honor of describing before a full meeting of the Society of Arts, in a paper read on the 24th of November last.

It is a well known fact that zinc, in a pure state, is even softer than copper, and, moreover, it has a natural tendency to retain the printing ink instead of giving it off freely, as steel and its basis, iron, will do. Every printer who has had zinc plates to work from can testify to the very limited number of good impressions which are obtainable from zinc plates, sometimes used for maps, plans, &c.; whereas the metal I use, as described in the specifications of my patent, is capable of yielding 10,000 impressions and upwards before the first coating shows signs of wear. This was exemplified at the last meeting of the Graphic Society, where I exhibited several engraved copperplates, forming part of a work shortly to be published, some of which had already produced 10,000 impressions, and this with one coating, without any perceptible difference between the first and the last impressions which I had sent with the plates.

Such a result will, I hope, establish in a satisfactory manner the superiority of the one metal over the other; for zinc cannot by any possibility compete with the harder metal—iron, which seems to acquire, by being deposited through galvanic agency, a power of cohesion and resistance much beyond that which pure iron possesses, and very nearly equal, for printing purposes, to the best steel used in the trade for making steel plates.

Porchester-terrace, February 10, 1859.

* From the Journal of the Society of Arts, No. 325.

Action of Hydrogen Gas on Metals.

M. Bekatoff, operating in the laboratory of M. Dumas, has discovered that:—

1. Common hydrogen, either as a gas or dissolved, displaces certain metals from their solution in acids. The metals with which he succeeded were silver and mercury.

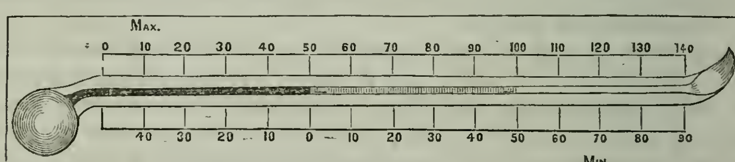
2. This action depends on the pressure of the gas and the dilution of the salt, or in other words, on the relative chemical mass of the reducing body.

3. It is probable that at higher pressures, the experiment will succeed with other metals.—*Academy of Sciences of Paris, February* 28, 1859.

*Notice of another New Maximum and Minimum Mercurial Thermometer.** By John G. Macvicar, D.D., Moffat.

The maximum and minimum thermometer described by me at page 221, volume x, of this journal is not the only one in which mercury may be used to give the minimum as well as the maximum for any interval of time between two successive adjustments. A more elegant instrument, at least for meteorological purposes, may be constructed thus:—

Let a mercurial maximum thermometer of the ordinary Rutherford's construction be taken, and let 50° or 60° in length of a suitable liquid be introduced into the stem immediately above the mercury, and into this liquid let two indices be inserted, first, one which shall obey the magnet, as in Rutherford's maximum thermometer, and then one of enamel, as in Rutherford's minimum. Let the instrument be then sealed in the usual way, and on the plate let two scales be engraved, one taking its points from the top of the mercury for a scale of maximum temperatures, and the other taking its points from the top of the liquid for a scale of minimum temperatures, and the instrument is completed. To prepare for an observation, let the enamel index be brought, as in Rutherford's minimum, to the top of the liquid: then holding or placing the instrument horizontally, let the steel index be brought by the magnet to the top of the mercury. The thermometer is now fit for use. It is obvious that the upper end of the enamel index will give the minimum and the lower end of the steel index the maximum temperature since the last adjustment.



I had contrived this instrument before that described at page 221, volume x, but passed from it at the time, in apprehension of not finding a liquid suitable for the suspension of the minimum index. Spirit and analogous liquids tend to diffuse with the mercury when in a horizontal column, and each breaks the continuity of the other. And though when this occurs, the instrument still remains a good mercurial minimum, yet it destroys its completeness and beauty.

I am now satisfied, however, that a liquid having no diffusive tendency or chemical action between it and mercury, as also a sufficiently low freezing point and high boiling point, may be found. In fact, between twenty and thirty years ago, Mr. Adie, the optician in Edinburgh, merely to prevent oxidation in the tubes of Rutherford's maximum thermometer, introduced above the mercury, naphtha; and I saw the other day one of these thermometers, which, during that long interval had preserved the mercurial column unbroken, and the steel index pure and all right. It is certain, however, that it is not every kind of liquid that passes in commerce under the name of naphtha that will do so. But the

* From the Quarterly Journ. of the Chem. Soc., July, 1858.

fact that a hydrocarbon was found which has continued to function well for a quarter of a century, shows that a suitable liquid may be found.

Residing, however, as I do, among the mountains of Scotland, far away from all facilities for accurate experiments, I must leave further determinations to those who are more favorably situated for such inquiries.

For the Journal of the Franklin Institute.

Particulars of the Steamer Pei-Ho.

Hull built by Thomas Collyer. Machinery by the Morgan Iron Works, New York. Owners, J. M. Forbes & Co. Intended service, China Seas.

HULL.—

Length on deck,	225 feet.
Breadth of beam, (molded,)	32 "
Depth of hold,	9 "
" to spar deck,	16 "

Frames—*molded*, 12 inches, *sided*, 14½ inches; apart at centres, 29 inches, and strapped with diagonal and double-laid braces $4 \times \frac{1}{2}$ ins.

Keel—Depth, 9 inches.

Independent steam, fire, and bilge pump—one—and boiler.

Bulkheads—two.

Draft of water, forward and aft,	11 " 6 "
Tonnage,	1110.

Area of immersed midship section at load draft of 11 ft. 6 ins., 315 sq. ft.

Masts, two.—Rig—Brigantine.

ENGINES.— Inclined oscillating.

Diameter of cylinder,	52 inches.
Length of stroke,	8 feet.
Maximum pressure of steam,	25 lbs.
Cut-off,	variable.
Maximum revolutions at above pressure,	22.

BOILERS.—Two—Return tubular.

Length of boilers,		18 feet.
Breadth "		12 " 6 inches.
Height " exclusive of steam chimney,		12 " 6 "
Number of furnaces—	six.	
Breadth of "		3 " 8 "
Length of grate-bars,		7 "
Number of tubes,	above 336.	
	below 32.	
Internal diameter of tubes,	above	3½ "
	below 16 ins., 10 ins. and	14 "
Length of tubes,	above	12 ft.
	below	3 ft. 11 "
Diameter of smoke pipe,		4 feet 10 "
Height "		32 "

PADDLE WHEELS.—

Diameter overboards,	28 feet.
Length of blades,	8 "
Depth of "	18 inches.
Number "	24.

Remarks.—Cabin and state-room on spar-deck. Floors filled in solid. Date of trial, April, 1859.

C. H. H.

For the Journal of the Franklin Institute.

Particulars of the Steamer Indianola.

Hull and Machinery by Harlan, Hollingsworth & Co., Wilmington, Delaware. Owners, Mora Bros., Navarro & Co. Intended service, New York to Havana.

HULL.—

Length on deck,		151 feet.
" at load line,		149 "
Breadth of beam, (molded,)		26 "
Depth of hold,		9 " 9 inches.
" to spar deck,		16 " 9 "
Length of engine room,		40 "

Frames—molded $3\frac{1}{2} \times \frac{3}{4}$ and $\frac{7}{8}$ inches $= 20\frac{1}{2}$ to 15 inches apart from centres. Sketch of shape |. Depth $3\frac{1}{2}$ ins.

Strakes—10 strakes of plates from keel to gunwales.
Diameter of rivets $\frac{3}{4}$ inch. Apart, $2\frac{1}{8}$ ins. Single riveted.
Thickness of plates, $\frac{5}{8}$, $\frac{1}{2}$, 7-16ths and $\frac{3}{8}$ inch.

Cross floors—10 in number, 18 inches high, with $2\frac{1}{2} \times 2\frac{1}{2}$" L iron on top.

Bulkheads, three.

Keelsons—8 fore and aft—main, side, and bilge.

Keel—depth 6 inches.

Draft of water at load line,	forward,		7 feet $1\frac{1}{2}$ inches.
	aft,		8 " $4\frac{1}{2}$ "
Tonnage,	Hull,	358 60-95ths.	
	Engine room,	74 10-95ths.	
Area of immersed section at load draft,			160 sq. feet.
Speed in miles,	with tide,	13.	
	against tide,	$9\frac{1}{2}$.	

Masts, two.—Square rig fore—Lugsail, aft.

ENGINE.—One—Direct acting—Condensing.

Diameter of cylinder,		32 inches.
Length of stroke,		2 " 4 "
Pressure of steam,	27 lbs.	
Cut-off,	half stroke.	
Maximum revolutions at above pressure,	70.	
Weight of engines,	64,000 lbs.	

BOILER.—One—Drop return flue.

Length of boiler,		20 feet.
Breadth "		9 " 6 inches.
Height " exclusive of steam chimney,		8 " 6 "
Weight " with water,	62,000 lbs.	
Number of furnaces,	2.	
Breadth "		4 " 1 "
Length of grate bars,		6 "
Number of flues,	above 16.	
	below 6.	
Internal diameter of flues,	above $8\frac{1}{2}$ ins.	
	below 2 of 21 ins., 2 of 17 ins., and 2 of 16 inches.	
Length of flues,	above 14 ft. 9 ins.	
	below 9 ft.	
Heating surface,		1077·26 sq. ft.
Diameter of smoke pipe,		3 " 11 "
Height " from grate bars,		38 " 6 "
Consumption of fuel per hour,	$\frac{3}{8}$ ton.	

PROPELLER.—

Diameter of screw,		8 feet 6 ins.
Length of "		3 " $8\frac{3}{8}$ "
Pitch of "		15 " 5 "
Number of blades,	4.	

Date of trial, March, 1859.

C. H. H.

Objects Rendered Visible in a Fog.

In a communication from Sir Henry* Brewster to the Academy of Sciences of Paris, he says:

"Whilst I was studying the polarization of the atmosphere, I observed this remarkable fact, that when distant objects are rendered indistinct by the interposition of a light fog, a part of their definiteness may be restored by looking at them through a Nicol-prism, which stops all the light which the fog has polarized in a plane passing through the sun, the object, and the eye of the observer. The objects thus made more distinct and visible, were seen through that portion of the fog in which the polarization of the reflected light was at a maximum.

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NOTE.—We remember to have seen somewhere, and to have published some years ago, a somewhat similar statement as to the efficiency of a simple plate of red glass to effect this same object. Will not some one who has a good opportunity, try this very simple experiment, which might be of great importance in preventing collisions upon our rivers and harbors during heavy fogs. ED. JOUR. FR. INST.

* The Comptes Rendus, both in the title and in the contents, says Sir Henry, but the nature of the communication itself, as well as its place among those of the members and correspondents of the Academy, show that it is really the distinguished optician, Sir David Brewster, who is the author of the article.

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*The Discovery of the Composition of Water.**

Mr. Bennett, of the British Museum, has addressed a letter to Sir Benjamin Brodie, Bart., which contains indisputable evidence in favor of Cavendish's claim to the discovery of the composition of water. The evidence was discovered by the late Robert Brown, Esq., and is not derived from any unpublished document, but forms part of a section of De Luc's "Idées sur la Météorologie," which, although specially entitled "*Anecdotes Relatives à la découverte de l'Eau sous la forme d'Air*," appears entirely to have escaped the notice of those who have advocated Cavendish's claims. It is the more conclusive as coming from De Luc, the "*ami zélé*," as he justly terms himself, of Watt, and who, in relation to this question, believed himself "à portée d'en connoître toutes les circonstances."

The testimony of De Luc is as follows:—Vers la fin de l'année 1782, j'allai à *Birmingham*, où le Dr. Priestley s'étoit établi depuis quelques années. Il me communiqua alors que, M. Cavendish, d'après une remarque de M. Warltine, qui avoit toujours trouvé de l'eau dans les vases où il avoit brûlé un mélange de *l'air inflammable* et *d'air atmosphérique*, s'étoit appliqué à découvrir la source de cette eau, et qu'il avoit trouvé qu'un mélange *d'air inflammable* et *d'air déphlogistique* en proportion convenable, étant allumé par l'étincelle électrique, se convertissoit tout entier en *eau*.—Je fus frappé au plus haut degré de cette découverte."—*Idées sur la Météorologie*, Tome 2, 1787, pp. 206–7.

The italics and inverted commas are De Luc's own.

In this communication, made by Cavendish to Priestley, the theory

* From the London Athenæum, Feb., 1859.

of the composition of water is clearly indicated. The two gases—known to have been hydrogen and oxygen—were mixed together *in due proportion*, and by means of the electric sparks were *entirely converted* into water. Referring to one of Cavendish's experiments, as recorded in his Journal, Lord Jeffrey, the most candid and judicious of Watt's advocates, has said, "If he (Cavendish) had even stated in the detail of it that the airs were *converted*, or *changed*, or *turned* into water, it would probably have been enough to have secured to him the credit of this discovery as well as to have given the scientific world the benefit of it in the event of his death before he could prevail on his modesty to claim it in public."—*Edinburgh Review*, vol. 87, p. 125.

The evidence which this distinguished critic and judge regarded as sufficient to establish Cavendish's claim is now afforded, not by a note in his private Journal, but by the testimony of the zealous friend of Watt, who states that it was communicated to Priestley towards the end of 1782, that is to say, several months before Watt drew his own conclusions from Priestley's bungling repetition of Cavendish's experiments. It was, moreover, published to the world and suffered to remain uncontradicted while all the parties were alive and in frequent intercourse with the author and with each other.

Mr. Bennett has felt it to be his duty as executor to the late Mr. Brown to communicate the foregoing particulars to the President of the Royal Society, by whom they have been laid before the Society.

It is a remarkable fact that notwithstanding all the researches made on many occasions during the past half century on the claim to the Discovery of the Composition of Water, and even within the past year by eminent *savans*, the evidence published by De Luc, in 1787, remained undiscovered, with an exception, that being as above mentioned, the late Robert Brown, Esq., and this is the more remarkable when we remember that De Luc's chapter, already referred to, is especially devoted to anecdotes on the subject in question.

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*New Method of Preparing Sulphurous Acid.** By E. F. Anthon.

The author placed

2 ounces of sulphur in fragments, and
25 ounces of concentrated sulphuric acid

into a glass flask, furnished with a gas tube, and heated it over a spirit-lamp. The sulphur soon melted, and in a short time there was an evolution of sulphurous acid which was conducted into water. The evolution was very uniform, and the burning of the spirit-lamp was continued until, after about six hours, there was only a comparatively small residue in the flask.

During this treatment the sulphur constantly floated in the form of a transparent hyacinth-red, thickly fluid mass on the hot sulphuric acid, and a small portion of it sublimed; part of this condensed again in drops upon the walls of the flask, and flowed back into the acid, whilst another part was deposited in the form of a thin crust in the neck of

* From the London Chemical Gazette, No. 105.

the flask. Very small quantities of sulphur were carried further mechanically by the sulphurous acid, and deposited in the conducting tube, and the water placed to absorb the gas.

After the conclusion of the process the flask contained only

4½ drachms of sulphuric acid, and
32 grains of unaltered sulphur.

The advantages of this process are:—

1. That it furnishes a pure product;
2. That it is easily effected, and cheap;
3. That the evolution of sulphurous acid gas is very uniform, the reason of which is that the sulphuric acid always acts only upon the outer surface of the melted sulphur, and this always forms a coherent mass; and
4. That no solid deposit settles to the bottom of the vessel of evolution, which, in other methods, so often occasions the cracking of the vessel.—Dingler's *Polyt. Journal*, cl. p. 379; and *Chem. Centralblatt*, Feb. 2, 1859, p. 78.

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*Rapidity of Thought or Nervous Action.** By M. Ule, Revue Suisse.

The method of transforming the valuation of time into space by the rapid revolution of a cylinder, proposed by Mr. Fizeau, has been applied to the measurement of the rapidity of nervous impulse. Such a cylinder rotating 1000 times a second, and divided into 360 degrees, may measure 1-360,000th part of a second; or rotating 1500 times a second, 1-540,000th part of a second; and even this may be subdivided by a microscope, so as to obtain the 10-millioneth, or perhaps 100-millioneth part of a second. By this extreme minuteness of subdivision of time, it is not difficult to measure even the rapidity of a nervous impulse. If an electric shock be given to the arm, it produces a sensation and a contraction of the muscles. Hence, by noting the interval of time between the shock and the contraction, the time occupied by the transmission of the sensation and the action of the brain, however quick, will be determined. By trying the experiment with different parts of the body, sensible differences have been observed, the shock applied to the thumb being one-thirtieth of a second behind that applied to the face; and this difference pertains to the transmission and not to the action of the brain, and hence enables us to eliminate the latter in the experiments. In this way it has been found by M. Helmholtz, by whom these experiments have been made with the most care:—1. That sensations are transmitted to the brain at a rapidity of about 180 *feet per second*, or at one-fifth the rate of sound; and this is nearly the same in all individuals. 2. The brain requires *one-tenth of a second* to transmit its orders to the nerves which preside over voluntary motion; but this amount varies much in different individuals, and in the same individual at different times, according to the disposition or the condition at the time, and is more regular the more

* From the Edin. New Philosophical Journal, Oct., 1858.

sustained the attention. 3. The time required to transmit an order to the muscles by the motor nerves is nearly the same as that required by the nerves of sensation to pass a sensation; moreover, it passes nearly one-hundredth of a second before the muscles are put in motion. 4. The whole operation requires one-and-a-quarter to two-tenths of a second. Consequently, when we speak of an active, ardent mind, or of one that is slow, cold, or apathetic, it is not a mere figure of rhetoric.

Uniform Diapason.

A committee was appointed by the French Government in 1858 to examine into the expediency of establishing throughout France a uniform pitch or tone for the regulation of musical instruments. On the report of this committee made by M. Halevy, the composer, a decree has been issued by which a uniform diapason has been created for all the musical establishments in France, Imperial and other theatres in Paris, and in the departments, conservatories, succursal schools, and public concerts authorized by the Government. The *la* (a') corresponds to 870 vibrations per second. It is to be called the Normal Diapason.—*Cosmos.*

The diapason adopted by the *Congres Scientifique* held at Stuttgard in 1834, was *la* $(a')=880$. This movement is therefore towards lowering the concert pitch. Savart gave as the diapason of the opera at Paris in 1834, $la=886\frac{8}{15}$. Another diapason given by M. Scheibler as that of the Academy of Music at Paris in the same year was 867·5. The starting point will now be $c=1{\cdot}01953125$. And the gamut will be as follows:—*ut* $(c')=522$. *re* $(d')=587{\cdot}25$. *mi* $(e')=652{\cdot}5$. *fa* $(f')=696$. *sol* $(g')=783$. *la* $(a')=870$. *si* $(b')=978{\cdot}75$. *ut* $(c'')=1044$.

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*Use of Words.**

A score of years ago there was talk about *endosmose* and *exosmose*, the gradual escape of gases through the barrier which ought to have kept them apart, and mixture with each other. These things exist in language: scientific words creep into common life, and *vice versa*:—*vice versa* itself is an instance. We know from Walter Scott and others that the sonorous word *meridian* came into Scotland to signify a dram taken at noon. We have recently found in an eminent man of the seventeenth century, no less a person than Huyghens, a proof of the universality of twelve o'clock as the dinner-hour in the seventeenth century. Speaking of the well-known method of double altitudes, he describes it as done by equal altitudes of the sun before and after *dinner*, a sound which he must have held to mean noon as to time, whatever it meant as to substance. It is much to be regretted that men of science never allow the long words to be corrupted down into something easier; what

* From the Lond. Athenæum, Feb., 1859.

a pity that they cannot hand them over to the vulgar to have the corners knocked off, since they will not take their terms out of our own language. To this day they cannot speak of the two parts of a fraction under nine syllables, *numerator* and *denominator*, which are always coming together, and make as much rattle as a cab driving up to the door. By a rough computation, we find that the amount of superfluous muscular contraction employed in speaking of fractions by all the mathematicians of Europe since the invention of printing, would, collected into one effort, have set the *Great Eastern* afloat, and carried her nearly three miles beyond the Nore! Why not cut these rattling polysyllables down into *numer* and *denomer*, pleasant and easy sounds? So much to the arithmeticians on one point: as Whiston said to Queen Caroline, when they have mended this fault, we will tell them of another.—*London Athenæum, Feb.*, 1859.

A New Silk-Worm.

M. Guerin-Meneville, announces to the Academy of Sciences, that he has succeeded in naturalizing in France a new variety of the silk-worm from China, which lives upon the leaves of the Ailanthus. He speaks of the silk as equal in quality and superior in quantity of that from the worm of the castor-oil plant, or even of the mulberry.

Might it not be worth while to some of our more enterprising farmers to endeavor again to introduce among us this most important branch of manufacture, which appears to have failed before, chiefly from becoming the object of a wild speculation? The ailanthus grows freely in this climate, and is much sought after in our cities as a hardy shade tree.

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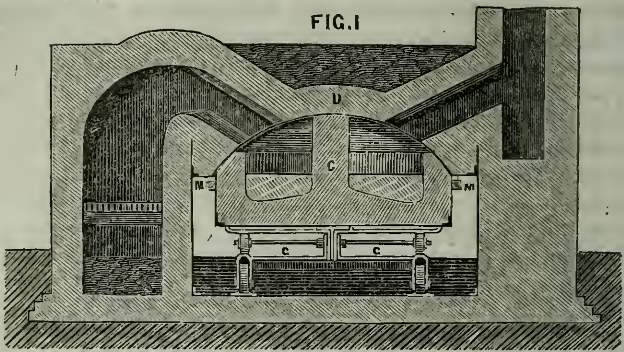
*Improved Furnaces for Manufacturing Iron.** By Jos. Maudslay.

Every engineer knows that immense expense is incurred in the manufacture of those large masses of wrought iron which have to be used for certain parts of steam engines for which ordinary cast iron cannot, with security, be employed. After many years' experience, especially in connexion with the manufacture of large marine engines for the Admiralty, Mr. Joseph Maudslay, of Lambeth, has instituted experiments with the view of producing an iron which should possess but little less strength than wrought iron, and at the same time be susceptible of being cast in moulds to the forms required; and he has been, to a very great extent, successful. The apparatus by which he effects his object is a rotating furnace moving about an inclined axis, as illustrated in figs. 1 and 2 of the annexed engravings, of which fig. 1 is a longitudinal vertical section, and fig. 2 a transverse vertical section through the bed of the furnace. C is the inclined bed of the furnace, which is made to revolve about an inclined axis; D, an arched cover above the furnace, which cover is supported by a fixed iron frame, or casing; E, the door through which the furnace is charged with metal; F, a tapping-hole through which the me-

* From the Lond. Mechanics' Mag., Jan., 1859.

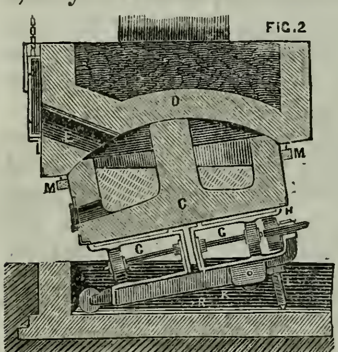
tal is run off; G, a roller frame, upon which the bed of the furnace revolves; H, a bevel pinion gearing into the teeth of the wheel for giving motion to the revolving bed; K, a lower frame furnished with wheels,

FIG. 1



by means of which the revolving bed, after being lowered by the screw L, may be withdrawn from beneath the arched cover for repairs or otherwise. The wheels of the lower frame run upon rails, R; M is a sand-joint for preventing the access of cold air into the furnace between the fixed top and the revolving bed; N is the flue leading to the chimney. The arrangement of the furnace above described is the best with which the inventor is at present acquainted for carrying his invention into effect, but he does not limit himself to the details thereof, as they may be variously modified.

FIG. 2



By keeping the metal stirred about for some time whilst in its molten condition, by means of the rotating furnace, the sulphur and other impurities contained in it are allowed to readily fly off, so that the apparatus answers, in some measure, the purpose of a puddling furnace, and leaves the metal itself in a semi-puddled state, somewhat approaching the condition of wrought iron, but still with sufficient fluidity to allow of its being run into moulds and used for many purposes for which wrought iron is at present employed.

The axis of the improved furnace is placed by preference about 10° out of the perpendicular.

On the Melting and Solidification of Water.

M. Mousson reports in the *Bibliotheque Universelle de Genève*, an interesting set of experiments made by him for the purpose of determining the effect of pressure on the melting point of ice.

He first exposed a number of capillary tubes of diameters varying from 0·0074 inch to 0·1 inch, and containing columns of water about 12 inches long, to the air. The exposure lasted seven days, during which

the temperature never rose above 28·5° Fah., and went down every night below 23° Fah. Upon withdrawing the tubes, all those whose diameter was greater than 0·36 inch had frozen; and all those whose diameter was less than 0·275 inch had remained liquid, nor did a sudden blow cause them to freeze. By arranging the tubes in an inclined position so as to plunge them in a vessel of water, it was found that the formation of the ice externally, favored their freezing. The two tubes of least diameter (0·013 and 0·0074 inch) alone remained liquid.

The sheet of water between two plates of glass pressed together by screws, will not freeze; but if they be simply laid on each other, the sheet which is then thicker, will freeze.

Blocks of ice from 3 to 4·5 inches cube were placed in a hydraulic press and reduced to sheets of a few hundredths of an inch in thickness. Although the temperature of the air was only a few degrees above the freezing point, the water trickled from the blocks on all sides.

In order to prevent the expansion of the water during freezing, a quantity was introduced into a cylindrical cavity of about 0·24 inch in diameter, in a heavy prism of wrought iron. The water in the cavity was compressed by a powerful screw, and then exposed to cold. The water remained liquid at 26·6° Fah. In an attempt to reduce the temperature to 23° Fah., the apparatus began to leak.

A quantity of water was then introduced into a cavity in a similar prism of steel, and after being frozen, the ice was compressed by means of a powerful screw moving a copper cone. The apparatus was surrounded by a freezing mixture, the temperature of which varied from —0·4° to —6·7° Fah.; the temperature of the air was below 32°, and the movement of the screw was performed so slowly as to make but two turns, (or forward motion) of 0·36 inch in four hours. The ice was liquified by the pressure, as was indicated by the position of a small wire index which had been frozen into the mass.

The pressure to which it had been exposed was 13,070 atmospheres, by which the freezing point was reduced below 0° Fah.

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*Can a suitable Insulating Material be found Possessing a Lower Specific Inductive Capacity than Gutta-percha?** By E. O. Wildman Whitehouse, Esq.

The amount of induction and consequent retardation in submarine wires—other conditions being alike—would seem to depend so greatly upon this property of the insulating sheath, that it would be most desirable that some experiments should be made with the object of determining this point.

A substance, or rather solution or compound, suggested by Mr. Statham, and recently perfected and adopted at the gutta-percha works —with which the wire is coated, before it receives the gutta-percha— will be found, if I mistake not, to be a step in this direction, while at the same time it enhances largely the perfection of the insulation.

It still might be an object of legitimate research to discover some

* From the London Mechanics' Magazine, October, 1858.

substance of very low specific inductive capacity, which shall possess all the mechanical and chemical properties requisite for this purpose. —*British Association*, 1858.

Curious Phenomena in Yellow Glass.

Mr. Ponting, in a letter to the London Photographic Society, states that he has used in the windows of his laboratory, panes of glass colored yellow by oxide of silver for five years without perceiving any change in their optical properties, until a week before the date of his letter, when he found that they had suddenly ceased to intercept the chemical rays. By careful comparison with others, he could not find that their color had perceptibly changed. *Cosmos, Oct.* 1, 1858.

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*Application of Photography to Wood Engraving.** By R. Hunt.

Numerous experiments have, from time to time, been made to produce photographic pictures upon box-wood blocks, of such a character that the wood engraver would be enabled to work upon them. Hitherto success has not attended these efforts; but from some examples which we have lately seen, there is every reason for supposing that the desired end will shortly be accomplished.

It should be understood that there is not the slightest difficulty in producing very perfect photographic pictures upon box-wood blocks. Even by applying the nitrate or the chloride of silver to the surface of the wood, very satisfactory photographs could be obtained; but the difficulty in this case is that the silver salt gives a brittleness to the wood, and it is liable to "chip off" under the tool; hence it is not possible to produce fine lines.

By coating the wood with albumen this has been avoided, but the wood engraver complains of the presence of the film of albumen preventing him from working with his usual facility. This objection is, however, almost entirely overcome by the use of collodion, the attenuated film offering scarcely any obstruction to the engraver's tool. All that is necessary is, to adopt one of the so-called dry collodion processes, and to obtain from a good negative on glass a positive copy on the block. It is important that the processes should be simplified as much as possible, to avoid all risk of injuring the wood. It is well to coat every part of the wood, except the face, with a thin layer of a transparent varnish, so that the iodized collodion may be applied, and the *face* dipped into the solution of nitrate of silver, without the risk of having any absorption. Again, in the slight fixing process which is necessary, no very high degree of permanence being required, this varnish also protects the wood. By employing a somewhat sluggish collodion process, very charming pictures may be easily obtained and rendered sufficiently permanent.

Now arises the wood engraver's difficulties. He has been trained to cut along certain well-defined lines, and he does not understand working upon a drawing in which there are none of those lines. It is, however, merely a question of education; the conventional system must

* From the London Art Journal, January, 1859.

be abandoned; and the engraver must be taught to use some judgment in the execution of his work. It has been proposed that practised draughtsmen should be employed to indicate, by lines on the photograph, where the wood should be cut. This would be still preserving the same mechanical system which at present exists. Something beyond this is required, and a class of engravers must be educated to work directly from the photograph, without any adventitious aid. We have before us a representation of an amphora, photographed on wood, and engraved by Mr. G. R. De Wilde, of Clerkenwell, which is, in itself, an admirable example of what may be done. This wood-cut shows that no real difficulty exists in the production of photographic pictures upon box-wood blocks, which may be cut, and from which very beautiful impressions may be obtained.

The advantages of such an application are manifold. The truthfulness, in the first place, is one of its greatest recommendations; and for objects which have any relation to science, this is paramount to every other consideration. The rapidity of production is another advantage, since it would enable authors and publishers to be far more liberal in their illustrations than they can afford to be at present.

At this time we have wood engraving advanced to a high degree of excellence, and we very justly admire the results; but if we could at once transfer to the wood the copy of a negative on glass, which represented some scene of sacred or historic interest, how much more satisfactory would it be to all. We know that the wood engraver is supplied with photographs of machinery and other objects, which he copies with great labor, by the pencil, on the wood. The same photograph on the wood should be at once available; and instead of the pencil, the wood-cutter should be instructed to use the graver. The perfection of such reproductions, as it regards the relative dimensions, distances, &c., and the correctness of all the details, would be unfailing recommendations. We learn that the wood engravers of Germany are now availing themselves of photography to a considerable extent; and we hope we shall not be long before we have to refer to English examples of this most useful application of a very beautiful art.

Saponification of Fats by Chloride of Zinc. By Leon Krafft and Tessie du Mottay.

"When any neutral fatty matter is heated with anhydrous chloride of zinc, we see it melt and disappear gradually as the temperature rises. Between 300° and 400° (Fahr.,) the mixture of the two bodies is complete. If the temperature be maintained for some time, and the mixture be then several times washed with warm water, or better, with water acidulated with hydrochloric acid, we obtain a fat which, when submitted to distillation, gives the fat acids which correspond to it, and with an insignificant production of acroleine. The wash-waters carry off almost the whole of the chloride employed, so that by evaporation this may be again used for another process. The fat acids are thus produced in as great quantities as by the common methods, and

have the same appearance, the same qualities, and the same fusing-point as those which are obtained after saponification by sulphuric acid. To operate well and quickly, the mixture should be heated rapidly until by the reaction of the two bodies on each other, which is of considerable violence, the vapor of water is abundantly evolved."

"In fact, the washing with acidulated water may be dispensed with; but the products then obtained by distillation are softer. If, however, the distillation be carried on by means of a current of superheated steam, this defect may be in a great measure cured. In all our experiments, the use of superheated steam produced the products more rapidly, more firm, and less colored."

The experiments were instituted with a view to allow the inhabitants of South America, to convert their fats into stearic acid, without the danger and expense of transporting sulphuric acid to those countries. In an economical point of view this problem is resolved, since the chloride of zinc is sold at Marseilles never higher than 2¼ cts. per pound, and packed in cases or barrels can be shipped without danger or inconvenience.—*Comptes Rendus de l'Academie des Sciences*, (*Paris*).

FRANKLIN INSTITUTE.

Proceedings of the Stated Monthly Meeting, April 21, 1859.

John Agnew, Vice President, in the chair.

John F. Frazer, Treasurer, present.

Washington Jones, Recording Secretary, P. T.

The minutes of the last meeting were read and approved.

A letter was read from the Royal Society of London.

Donations to the Library were received from the Institute of Actuaries, and the Chemical Society of London; La Société Industrielle du Mulhouse, France; the Lower Austrian Mechanics' Association, Vienna, Austria; the Smithsonian Institution, Washington City, D. C.; the Mercantile Library Association, St. Louis, Missouri; H. Bailliere, Esq., City of New York; the Mercantile Library Association, Brooklyn, New York; the Long Island Railroad Co., New York; the Ohio Mechanics' Association, Cincinnati, Ohio; the State of Pennsylvania; Dr. T. B. Wilson, Prof. John F. Frazer, T. S. Stewart, Esq., Prof. F. Rogers, Prof. B. H. Rand, Prof. J. A. Meigs, and George M. Conarroe, Esq., Philadelphia.

The Periodicals received in exchange for the Journal of the Institute, were laid on the table.

The Treasurer read his statement for March.

The Board of Managers and Standing Committees reported their minutes.

The Board of Managers reported that Uriah A. Boyden, Esq., of Boston, Mass., has deposited with the Institute $1000, which he requests the Institute to award to "such person as shall, by researching in North America, prove to the satisfaction of the Institute, whether

all the rays which may be known, have or have not equal velocities of transmission."

The Board of Managers have, on the recommendation of the Managers of the Sinking Fund and Finance, accepted the Trust, and have appointed a special Committee consisting of Professors John C. Cresson, John F. Frazer, and Alex. Dallas Bache, to define the terms of the premium; and the Board now report their action in the case, and ask the sanction of the Institute.

On motion of Mr. C. B. Rogers, it was

Resolved—That the Franklin Institute sanction the action of the Board of Managers in the subject of the prize proposed by Mr. U. A. Boyden.

The Actuary reported that the following Standing Committees have organized by electing their Chairman, and appointing their times of meeting:—

Committees.	*Chairman.*	*Meetings.*
On Models,	Wm. B. Bement,	2d Monday evening.
" Meteorology,	Prof. J. A. Kirkpatrick,	3d Friday "

Candidates for membership in the Institute (5) were proposed, and those proposed at the last meeting (3) were duly elected.

Mr. J. E. Wootten presented his patented design for gauge-cocks intended to indicate the exact height of the water in steam boilers. It resembles somewhat that invented by Mr. Tyler, but has some additions and improvements. A full description with a cut will be given in the *Journal of the Franklin Institute* for June.

BIBLIOGRAPHICAL NOTICE.

Journal of the American Geographical and Statistical Society. 4to. monthly, pp. 32. Published for the Society by John H. Schuttz & Co., 9, Spruce St., New York.

The American Geographical and Statistical Society of New York, is one of our most flourishing, as it is one of our most deserving scientific bodies. We have always read with great interest the imperfect report of their proceedings as published in the daily papers, and have preserved, as of great value, many of the communications which have been made to them on the subject of geography, especially that of our own continent.

We are glad to find that they have determined to publish a Journal in which these valuable materials will be hereafter preserved in an accessible form. The two numbers of this new publication which are now before us, have a great number of very interesting articles on a variety of subjects, kindred to the purposes of the society, illustrated by maps and tables; and the manner in which they are presented to the world is creditable to the Society and to the publishers.

We strongly recommend this Journal to the notice of those of our subscribers who are interested in geography and statistics.

Ed. F. I. J.

Abstract of Meteorological Observations for February, 1859; made in Philadelphia, Somerset, and Dauphin Counties, Pennsylvania, for the Committee on Meteorology of the Franklin Institute.

PHILADELPHIA.—Lat. 39° 57′ 28″ N. Long. 75° 10′ 28″ W. Height above the sea 50 feet. Prof. J. A. KIRKPATRICK, Observer.

1859. Feb.	Barometer. Mean.	Barometer. Mean daily range.	Thermometer. Mean.	Thermometer. Daily oscillation.	Thermometer. Mean daily range.	Relative humidity. 2 P.M.	Force of vapor. 2 P.M.	Rain and Snow.	Prevail'g winds.
	Inch.	Inch.	°	°	°	Per ct.	Inch.	Inches.	Direc.
1	30·059	·152	36·2	19	4.5	45	·129		(var.)
● 2	29·750	·310	38·5	12	2·3	68	·195	0·640	N E.
3	29·502	·248	34·0	5	5·5	95	·186	0·045	N N E.
4	29·663	·162	35·3	10	3·3	55	·130	0·010	S W.
5	30·119	·456	30·3	11	5·0	60	·113		N W.
6	29·972	·166	33·2	7	2·7	95	·189	0·732	N E.
7	30·113	·163	29·3	8	3·8	69	·125		N W.
8	30·047	·151	31·5	18	6 2	80	·162		N N E.
9	29·508	·539	38·3	9	6·8	86	·214	0·210	(var.)
☽ 10	29·821	·371	28·0	10	10·3	67	·112		N W.
11	30·209	·387	22·8	7	5·2	61	·078	0·008	S.
12	30·004	·205	28 3	12	5 5	78	·130		N E.
13	30·053	·049	28·7	9	1·0	74	·135		(var.)
14	30·041	·009	34·3	17	5·7	34	·081		W N W
15	29·821	·221	39·0	10	4·7	82	·212	0·135	(var.)
16	29·826	·144	44·0	14	5·0	78	·283	0·166	(var.)
○ 17	30 148	·322	40·7	13	3·3	62	·191		(var.)
18	29·877	·271	42·3	8	2·3	84	·252	0·555	N N E.
19	29·949	·159	38·7	10	3·7	82	·203	0·350	(var.)
20	29·527	·423	49·7	15	11·0	93	·404	0·020	(var.)
21	29 784	·257	36·3	0	13·3	31	·077		W N W
22	29·983	·166	41 7	23	8·0	35	·135		S W.
23	29·842	·141	49·0	29	7·3	36	·201		S W.
☾ 24	29·776	·207	42·7	21	12·3	44	·152		N W.
25	29·996	·225	28·0	8	14·7	76	·112	0·250	N E.
26	29 755	·238	35·7	15	7·7	81	·194	0·448	N E.
27	29·834	·145	40·8	27	8·5	33	·129		S W.
28	29·803	·175	42·7	13	6·2	37	·129		W N W
Means	29·885	·230	36·4	13	6·3	65	·166	3·569	N 43° W

SOMERSET, Somerset Co. Lat. 40° N., Lon. 79° 3′ W. Height 2195 feet. GEO. MOWRY, Observer.

1859. Feb.	Barometer. Mean.	Barometer. Mean daily range.	Ther. Mean.	Ther. Mean daily range.	Relative humidity. 2 P.M.	Force of vapor. 2 P.M.	Rain and Snow.	Prevail'g winds
	Inch.	Inch.	°	°	Per ct.	Inch.	Inch.	Direc.
1	27·732	·152	33·7	6·3	61	·191		W.
● 2	27·337	·385	34·7	7·0	55	·130		S E.
3	27·194	·197	30·7	4·7	100	·181	0·215	W.
4	27·364	·128	23·3	8·0	89	·168	0·070	W.
5	27·695	·384	26·7	6·0	55	·130		(var.)
6	27·691	·013	27·3	8·0	89	·161		(var.)
7	27·739	·061	26·7	6·7	44	·111		(var.)
8	27·617	·113	30·0	5·3	81	·186		S S E.
9	27·271	·342	35·0	5·7	100	·257	0·426	(var.)
☽ 10	27 616	·288	18·7	16·3	100	·135		N N W.
11	27·754	·189	18·3	3·7	100	·118	0·047	S E.
12	27·662	·113	28·7	10·3	95	·168	0·039	W.
13	27·742	·095	20·7	8·0	100	·135	0·053	W.
14	27·706	·026	29·7	11 3	63	144		S W.
15	27·471	·243	40·3	11·0	100	·257	0·801	W S W.
16	27·604	·133	38·7	5·7	87	·238		N W.
○ 17	27·696	·170	35·7	4·3	69	·176	0·657	S S E.
18	27·603	·145	42·7	7·0	66	·288		(var.)
19	27·558	·074	44·0	8 7	100	·299	0·980	S.
20	27·298	·337	44·3	11·7	68	·204		W.
21	27·633	·344	27·3	17·0	88	·153		W.
22	27·697	·109	36·0	8·7	66	·208		S W.
23	27·601	·104	48·3	12·3	59	·295	0·153	(var.)
☾ 24	27·607	·052	38·3	10·0	64	·160		N W.
25	27·499	·092	24·3	14·0	100	·141	0·643	S E.
26	27·467	·064	35·3	11·0	60	·153	0·303	W.
27	27·475	·086	40·3	9·7	49	·205		S.
28	27·631	·129	32·3	13·3	53	·116		W.
Means	27·570	·163	32·5	9·0	77	·182	4·387	

HARRISBURG, Dauphin Co. Lat. 40° 16′, N. Long. 76° 15′, W. JOHN HEISELY, M D., Observer.

1859. Feb.	Barometer. Mean.	Barometer. Mean daily range.	Ther. Mean.	Ther. Mean daily range.	Prevail'g winds
	Inch.	Inch.	°	°	Direc.
1	29·965	·160	35·7	5·0	N.
● 2	29 590	·375	36·7	1·7	E.
3	29·348	·188	34·7	2·7	E.
4					S.
5	30·019		28·3		N W.
6	29·900	·138	33·9	4·7	S E.
7	30·015	·121	31·3	1·7	N W.
8	29·947	·090	31·3	2·0	S E.
9	29·414	·533	38·3	7·0	S E.
☽ 10	29·750	·361	28·7	9·7	N W.
11	30·093	·342	26·0	2·7	E.
12	29·909	·183	29·0	3·0	S E.
13	29 986	·077	29·7	2 0	W.
14	29·934	·053	34·7	5 0	N W.
15	29·689	·245	38·3	3·7	E.
16	29·721	·170	42·7	4·3	W.
○ 17	30·009	·289	38·3	4·3	E.
18	29·782	·361	40·7	2·3	E.
19	29·812	·154	39·0	1·7	S E.
20	29·326	·486	45·7	6·7	N W.
21	29·731	·405	35·0	10·7	N W.
22	29·862	·164	41·7	6·7	W.
23	29·699	·163	46·3	4·7	W.
☾ 24	29·709	·174	44·3	9·3	N W.
25	29·865	·194	27·7	16·7	S E.
26	29·678	·187	32 0	7·7	S E.
27	29·704	·120	38·7	6·7	S E.
28	29·712	·195	41·7	6·3	N W.
Means	29·784	·228	34·3	5·3	

JOURNAL

OF

THE FRANKLIN INSTITUTE

OF THE STATE OF PENNSYLVANIA,

FOR THE

PROMOTION OF THE MECHANIC ARTS.

JUNE, 1859.

CIVIL ENGINEERING.

For the Journal of the Franklin Institute.

Steam and its Condensation. By Thomas Prosser, C. E.

(Continued from page 294.)

CHAPTER VII.

On the Steam Jacket of Gordon McKay, Esq.

What is the precise nature of the information furnished by Gordon McKay, Esq., (*p.* 232, *anti*,) in relation to the economy of the steam jacket? I confess myself totally unable to comprehend it, except on the assumption, that the fuel consumed was in exact proportion to the water which left the boiler. I trust the presumption is a fair one, in the absence of any allusion whatever to the nature or quantity of the fuel consumed, which is in reality the only consideration worth notice, and which, therefore, I presume, was inadvertently omitted.

Still, I am not out of my difficulties in this matter; for I cannot comprehend how, in the first experiment, nearly one-third of "the water evaporated from the boiler" was "used in leaks of joints, boiler, &c." (There should be no *&c.*, in experiments of this kind,) 500·7 lbs. of water leaves the boiler, of which 164 lbs. is not accounted for as steam. Surely, then, it must have condensed in the cylinder, or gone over as water in a vesicular state, notwithstanding the steam jacket and four inches of cotton over that, for I cannot suppose Mr. McKay really means to be understood as using such a leaky concern, as his language implies. Therefore, putting the best construction upon it, it affords but little encouragement for steam jackets.

It appears that 15·7 lbs. of steam was condensed in the jacket and returned to the boiler as water at 328° F. to be re-evaporated, for it was just as much new water as if it had been taken from the reservoir, and is therefore very properly added to the weight of water evaporated, but note, its temperature was much higher. How much, we are not informed; but if we assume the reservoir water to have been at 60° F., we have 268° = (328—60). Now the latent heat of steam at 328° F. is about 856°, and if we multiply that by 15·7 lbs., we get 13439° of latent heat, which has gone into the cylinder to keep it warm—that is the cost of it. Well, we have against that, in the second experiment, 145 = (630—485) lbs. of water more than in the first experiment, which left the boiler and passed through the cylinder. Now as McKay acknowledges that the condensation is in proportion to the condensing surfaces, (and of course multiplied by the difference of temperature, which I have more than once shown in this *Journal*,) it follows that no more steam can by any possibility be condensed, for the cylinder attains the same normal state of temperature in both cases; and therefore the 145 lbs. of water additional must have gone over in a vesicular state, entering the cylinder at 328° F. and leaving it at 220°. Thus the cylinder has absorbed 108° = (328—220), which being multiplied by 145 lbs. gives 15660° of heat required to keep the cylinder warm, with vesicular water entering it on the inside and parting with its sensible heat, against 13439° of heat required on the outside thereof and within the jacket, with steam parting with its latent heat. But, 15·7 lbs. of the water in the first experiment, had a temperature of 268° higher than the same quantity of water in the second one; and if we multiply 15·7 lbs. by 268°, we have 4207·6° to be deducted from 15660°, leaving but 11452·4° of heat, or 1986·6° less to keep the cylinder warm without the steam jacket than was required with it. I am assuming here, that 26·3 lbs. of the vesicular water, after it had left the cylinder at 220° F., was available for re-evaporation in the boiler, as a set-off against the 15·7 at 328° in the first experiment, for 26·3 × (220—60) = 15·7 × (328—60). Doubtless more than this 26·3 lbs. of the 145 lbs. was available to economize the fuel, and therefore at whatever lower temperature the hot water assumed, the quantity of heat was available just the same, by increasing the quantity of hot water from an ample store.

I am really very sorry for steam jackets, for it certainly does look like being worth about 15 per cent. less than nothing.

This I think cannot be—but it is a legitimate conclusion, and the only one as it appears to me which can well be arrived at from the data given, and does support the view taken by "engineers of high standing, who deny the efficacy of the steam jacket," and consider it "a positive injury." Tredgold supports this view of the case and one of his editors the opposite.

I will mention here a fact which I have observed, that, in a boiler which ordinarily delivers its steam at more than 20° F. (and sometimes 47°) hotter than the water that it is produced from (caused by the tube heating surface passing through the steam), the temperature has been

41° F. below it. One thermometer was in the steam and another in the water; both were plunged into baths of mercury, surrounded with a jacket in fact, and well clothed with felt and canvass. The work light, the fire down, and damper open, the rush of cold air will at any time have a similar effect, although not often to such an extent as above noticed.

Now where there is no steam jacket, there is a greater draft on the boiler from the cylinder to keep up its normal temperature. If the steam is sufficiently surcharged, there is then no condensation in the cylinder (but there is a cutting up of the valve faces). If there is just the same amount of condensation as there is with a steam jacket, then the superheat supplies the place of the steam in the jacket. But, if the boiler cannot supply this *heat* in the shape of steam in a superheated state, it will supply it in the shape of vesicular water, that being the cheapest form in which it can do it, the temperature of the steam falls below that of the water from which it is produced, radiation is reduced, and the greater specific heat of water over steam is brought into economical operation; for, as I take it, a change of state cannot be produced at *no* cost.

I confess to having entertained different sentiments in relation to my old friend the steam jacket, and that I am now groping about in the dark, as it appears to me that Mr. McKay also is; at the same time I am much obliged to him, as everybody should be, for spending his money and his time in endeavoring to unravel the mysteries of this very difficult subject. As Mr. McKay has a boiler and engine constructed expressly for the purpose, may I suggest to him a repetition of the second experiment with a little alteration, viz: to place the reservoir sufficiently low to allow of the return of the vesicular water, and as much of the condensed steam as condenses spontaneous in the atmosphere, into a small vessel, at the top, and communicating with his reservoir at the bottom of both by means of a pipe, and taking his feed-water from the top of the small vessel, so as to pump all the hot water which offers into the boiler first.

By this means, and noting accurately the weight of fuel burned, I anticipate a saving in fuel will be observed.

By my "method of applying the power of steam and condensing the same," as described in this *Journal*,* I can, at will, produce this vesicular water, otherwise called priming, together with the water of condensation in the cylinder, and exhibit them in a manner which no other system admits of; and hence, even as a mere study of the physiology of the steam engine, it is highly interesting, and as a practical test of the fireman's skill and fidelity, entirely reliable. When the vesicular water is going over, the steam gauge does not necessarily fall, nor the water in the boiler lose in temperature; nay, even quite the contrary may happen and often does, but the temperature of the steam is invariably found to be below that of the water, a fact which I believe has never before been recorded if observed.

* Engineers affect to make a distinction between vesicular water and priming; in the latter case, they say, the water goes over in a body; but, where is the line of demarcation? What the difference?

When this vesicular water comes over in my system, and mixes with the condensed steam from the cylinder, it all goes to waste together, for nothing but pure steam enters the condenser; its temperature is ordinarily about 230° F., while that of the feed water may be, say, 200° F., in which case the 30° F. of difference is an entire loss, and hence it should be prevented and the steam worked moderately dry, but not so dry as to cause cutting of the valve faces, which will always occur when there is no condensation in the cylinder to lubricate them, in the absence of grease—a thing of very questionable utility in working with wet steam—which term properly applies, as I believe, to all steam made in the ordinary way, and I have no doubt that such steam is generally of a lower temperature than the water it is produced from.

To this cause, independent of steam space in the boiler, I attribute priming; for if a boiler makes the steam and *surcharges* it, just as fast as the engine takes it, there will be no priming, however small the steam space may be. But if the engine makes a suddenly increased demand upon the boiler, or if too much air is admitted over the fire, or the damper is too wide open, any of these may cause a fall in the temperature of the steam without a corresponding one in that of the water; and whenever the steam is at a lower temperature than the water, and not before, priming will commence, for the reason, as I have before stated, that hot water is cheaper than steam—the demand being not for more working steam only, but for more heat to keep the cylinder at the normal temperature, that is to say, at the same temperature as a steam jacket would keep it, due to that of the working steam whatever it may be; for the condensation of the working steam is not a per centage of that which enters the cylinder; therefore, the speed of the piston has nothing to do with it; it is a fixed quantity, and is the product of the surface to which it is exposed, and the difference of temperature between those factors. Expanding the steam modifies the action, not the principle, by causing water of condensation in the cylinder to re-boil on the removal of the pressure and thus resume its latent heat, thereby showing a higher degree of tension than is due to the expansion.

We may next consider the question of a steam jacket for low pressure, or rather I suppose we must say, for an air-pump condensing engine.

Now, with a steam jacket the steam leaves its latent heat in the cylinder, and returns the water at the same temperature as the steam in the boiler, and that water is re-evaporated as in Mr. McKay's first experiment. And without a steam jacket, as much vesicular water has to go over into the cylinder as will compensate, by its sensible heat, for the absence of the latent heat of the steam in the jacket. We need not go far to determine this question, for if Mr. McKay's second experiment has been rightly disposed of, as showing there is no advantage in the steam jacket when the effluent vesicular water and condensed steam from the cylinder are available as feed-water at a high temperature, we have only to ascertain the effect of reducing the temperature of that water 100° F. lower in consequence of the intro-

duction of the air-pump condenser. The product of $15 \cdot 7 \times 100°$ is $1570°$, which is only about one-tenth of the heat required to keep the cylinder warm according to the experiments; and therefore, if a gain in fact, it is one not worth incurring the expense of a steam jacket to obtain. More particularly is this the case with the method which I have adopted of surcharging the steam (making that, too, a part of the economic supervision through the medium of two thermometers), for the same effect is produced and in a much better manner. By surcharging the steam we prevent vesicular water going over into the cylinder (priming), and as far as is desirable the condensation of the working steam therein. This superheat goes into the cylinder and keeps up its normal temperature by which the amount of condensation allowed is governed. And thus the hot water remains in the boiler, which will otherwise have to go over into the cylinder, and from thence into the condenser, where its life is extinguished in a "wishy-washy everlasting flood" of cold water, which has to be pumped back again into the boiler against the pressure of the steam therein.

The steam jacket came into existence, as Mr. McKay observes, in 1769. The air-pump came with it. As in the ethical so in the physical sciences, one false position requires another to back it. The steam jacket would never have been thought of, had not the air-pump been introduced. They have both now attained to a respectable old age, and had better be allowed to die in peace. "Proselytes are ardent partizans," and I am a convert of but a week old to this new doctrine. I have arrived at the conclusion stated, solely by observing the phenomena exhibited by the two thermometers alluded to. The Board of Engineers appointed by the Hon. Isaac Toucey, Secretary of the Navy, to examine into my system, consists of Messrs. Isherwood, King, and Everett; and the former of these gentlemen suggested that a thermometer be placed in the steam space of the boiler to compare with the steam pressure as shown by the gauge, for the purpose of ascertaining the amount (*if any ?*) of superheat in the steam. This was done, but nothing could be made out of it. The pressure and temperature appeared to have no sort of connexion with each other, but were perpetually varying. I then placed a thermometer in the water also, and the cause of the erratic movements of the steam was at once discovered, and will, I confidently predict, throw more light upon this difficult subject than it has ever before received. The extreme observed range of variation in the temperature of the steam, above and below that of the water from which it was produced, has been thus far 88° F.; that is to say, the steam has been observed at 41° below, and 47° above the temperature of the water.

The extreme susceptibility of the steam to the action of the fire, at once shows whether the combustion is proceeding properly or not, and two thermometers should therefore be placed upon every boiler to guide the fireman and indicate whether he is skilful, vigilant, and faithful, or not, for there is no possible means by which he can evade the searching scrutiny of those silent monitors.

*The Magnitude of the Public Works of the United States.**

From the New York Times.

It has been fashionable to compare unfavorably the works of this country with those of Europe. To such an extent has this been carried that it is not unfrequently said that we have to look to England or the Continent for most of our examples. We are continually told by travelers of the great extent, beauty, and durability of the continental works, and of the enormous strength of the English structures. Now it is perfectly true that Europe can boast of the railroads, canals, bridges, and aqueducts unrivaled in the world for beauty and excellence of workmanship and design, but it is equally true that America can point to works of utility that, in the magnificence of their proportions, are not exceeded anywhere.

The Julian Aqueduct, of Rome, is two miles longer than the Croton Aqueduct, of New York, built by John B. Jervise and Horatio Allen, but the Croton carries more water than all the seven aqueducts of Rome put together, and more than any other aqueduct in the world, and is longer than any other, excepting the Julian.

The Illinois Central Railroad, built by Col. Mason, is the longest line ever constructed by one company, and in point of workmanship is equal to any European road.

The National Road over the Cumberland mountains, built by the United States Engineer Corps, is more extensive and durable by far than the Appian Way.

The stone arch over Cabin John's Creek, on the Washington Aqueduct, built by Captain Meigs, is about fifty feet greater than any other stone arch in the world, and is more beautiful in proportion than the arch over the Oca, so long celebrated for its magnificence.

The tunnel built by Mr. Haupt, on the summit of the Pennsylvania Railroad, was a more difficult work than the tunnel under the Thames.

The structures on the Baltimore and the Ohio Railroad at Harper's Ferry, and beyond the summit, built by Latrobe, and the Starrocca Viaduct, on the New York and Erie Railroad, built by Julius Adams, are equal in magnificence and excellence of workmanship to anything Brunel ever did in England, or Moran in France.

The Suspension Bridge over the Niagara River, at Lewiston, built by Major Serrell, is 1042 feet 10 inches in one span, and is 43 feet greater than any other single span in the world, being nearly twice as great and quite as strong as Telford's celebrated bridge over the Menai Straits in England.

The United States Dry Dock at Brooklyn is the largest dry dock in the world by many feet. The workmanship, done under the direction of Mr. McAlpine and General Stuart, is equal, if not superior, to anything of the kind anywhere. The plates of iron used in the gates of this dock are the largest that had been made up to the time they were rolled.

The flight of combined locks on the Erie Canal, at Lockport, built by the State Engineers, is equalled only in one other place in Christendom—Sweden.

* From the Salem Register, April 21, 1859.

The Railroad Suspension Bridge, built by Rœbling, over the Niagara, is within a few feet of twice the span of Stephenson's great Tubular Bridge in England, the largest structure of the kind. It is 800 feet in one span, and is two stories high, the railroad being above the public highway. Nothing like this exists anywhere else.

The Light-house on Minot's Ledge, being built by Captain Alexander, is in a more exposed situation, and, as far as proceeded with, is more securely bolted together than the famous Eddystone Lighthouse in England.

The Bridge at Wheeling, built by Charles Ellet, is exceeded only in span by the Lewiston Bridge, and is heavier than it; it is the second largest span in the world, and is much more beautiful than the Fribourg Bridge, its European rival.

In carpentry we are unexcelled in the world. Such structures in timber as the Dry Docks at San Francisco and Philadelphia, McCullam's and Col. Seymour's bridges on the Erie Railroad and branches, the timber viaducts on the Cattawissa Railroad, built by Stancleff, Col. Long's bridges on the various New England railroads, and How's trusses at Harrisburg, have not their equals across the Atlantic.

Then, again, in Europe many structures are built that might have been avoided—a few hundred rods of detour would have saved the great Box tunnel. Now we maintain that the location of Sidell's division, for example, on the Erie, evinced more skill in avoiding the necessity of great structures than could be shown in building them.

The stones on either corner of the Exchange in Boston, built by Rodgers, are larger than any single stone in Cleopatra's Needle, and those now being put into the United States Treasury, at Washington, are much heavier than any stone of Pompey's Pillar, or the Pyramids of Egypt.

As to the difficulties of location, there is no country where more science and skill have been brought to bear than in ours, and it is a remarkable fact that, in point of time, last year, our average traveling was faster by two and a half miles per hour than in England, comparing our principal lines with theirs, while the charges on the American lines were but little over half the English rates.

The reason why these things are not generally known is, that here we build a great work, announce its completion in the same advertisement that heralds the opening of the road, and no more is said about it, except, perhaps, what may appear in one or two scientific periodicals, where dry feet and inches, stress, strain, and torsion are discussed, and are never read except by the professional engineer.—While on the contrary, in England and France, as soon as a great work is built, and while it is being erected, pictures by thousands are published, medals are struck and circulated, glass models are made, and the illustrated newspapers show it in every stage of progress and from every point of view; the engineer is knighted, if he is not already of the nobility, and the fame of the structure is sent from land to land; while with us, as we have shown, may be found some of the most gigantic works ever undertaken that are passed by and

over without hardly any notice. It is remarkable that the best popular descriptions of our own public works of great magnitude are to be found in the journals of France and Germany. AMERICUS.

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*On the Successful Working, by Locomotive Power, over Gradients of 1 in 17, and Curves of 300 feet radius, on inclines in America.** By Mr. T. S. ISAAC.

[Read before the Institution of Civil Engineers, Nov. 23, 1858.]

(Continued from page 310.)

Discussion.—It was explained that on the Baltimore and Ohio Railway the ordinary goods engines had cylinders of 19 inches diameter, with a stroke of 22 inches: they had eight driving-wheels, of 3 ft. 7 ins. diameter, all coupled. The passenger engines principally employed on the inclines of 1 in 45½, had cylinders of 19 inches diameter and 22 inches stroke, with six driving-wheels, 4 feet 2 inches diameter, all coupled, and a leading truck or "bogie" on four wheels. Peculiar arrangements were made for facilitating the passage over curves of small radius: the centres of the front and hind wheels were only 11 ft. 3 ins. apart, and the intermediate wheels were without any flanches,—the springs being so adjusted as to equalize the weight.

It was stated, that the adhesion of driving-wheels had been shown, from experience in the United States, to be beyond the limits usually assigned. Instances were known where the effective adhesion had been as much as two-fifths of the nominal weight on the driving-wheels; it being assumed that this varied much when running, as compared with the actual weight ascertained by the weighing machine when at rest.

On the Cleveland and Pittsburgh Railway, on the 1st August, 1857, a train of fifty loaded wagons, each on eight wheels, and weighing, with the engine and tender, 800 tons, was drawn up a continuous incline, two miles in length, of 1 in 132. The engine weighed 26·8 tons, with only 19·2 tons on the six coupled wheels. The gravity of the entire train would be 13,575 lbs., whilst the friction, which could not average less than 5 lbs. per ton, would increase the amount to 17,575 lbs., or to more than two-fifths of the weight upon the driving-wheels.

In making a series of trials for the New York and Erie Railway, Mr. Zerah Colburn drove a train of eighty wagons, each on eight wheels, weighing, with the engine and tender, 1270 tons, up a continuous incline of about 1 in 480, with curves of 1145 feet radius. The gravity being 6000 lbs., and the other resistances 8300 lbs., the entire resistance was 14,300 lbs. The weight on the driving-wheels of the engine, at rest, was 40,500 lbs.; hence the adhesion was 0·35 of the insistent weight.

An engine, when on a severe incline, changed its position so much as to alter materially its running condition, which should be provided for in building engines expressly for working inclines.

It was stated that, at the time of construction of the Mountain Top Incline, it was found necessary to place a tank on the eastern slope,

* From the Lond. Mechanics' Mag., Dec., 1858.

on a gradient of 1 in 18·87. During the first two or three summers, the ascending trains were in the habit of stopping daily, and the engines were able to start again without difficulty. There was one engine on the mountain on eight wheels, all coupled; the cylinders were 18 ins. in diameter, with a length of stroke of 22 ins.; the wheels were 3½ feet in diameter, and the gross weight of the engine was 27 tons. This engine had crossed the mountain six times in one day, with a load of 49 tons each time; making the trip in one hour from Turntable to Greenwood, and in one hour and a quarter from Greenwood to Turntable; although it was very rigid and was not adapted to the curves. One of the lighter engines had taken a load from Turntable to Greenwood in half an hour. Mr. Ellet had published a statement of the cost of working, based on the fuel and oil consumed, and the wages of the workmen. Fuel on the mountain cost two dollars per cord. It was difficult to make a just comparison of the various fuels, and to obtain correct information as to the water evaporated. The same cause that prevented the experiments on the resistance of curves, prevented comparative experiments on fuels, and accurate statements of the water evaporated. At first pine was used, but oak had been extensively adopted latterly. The effective pressure of the steam, above that of the atmosphere, usually amounted to from 100 lbs. to 120 lbs.

It was remarked that, whereas, on most English railways, the results of experience showed a resistance of 12 lbs. per ton gross on a level, yet some of the statements which had been made as to the working of railways in the United States, seemed to indicate a resistance of not more than 5 lbs. per ton gross, after allowing for gravitation on the incline; whilst the permanent way of American lines was notoriously inferior in all respects to that of the English lines. The first of the results named in the paper showed a traction resistance of about 150 lbs. per ton gross. In contrast with this, it was stated that, on the Great North of Scotland Railway, near Aberdeen, the Kitty Brewster Incline of 1 in 59, and full of quick curves, had been worked for the last three years by two tank locomotives, having cylinders 15 inches diameter, with a length of stroke of 24 inches, and four wheels coupled, each 4½ feet diameter, at a steam pressure of 150 lbs.; the load on the driving-wheels being 15 tons, on the leading wheels 10 tons, and the gross weight, in working order, 25 tons. The trains were started from the foot of the incline. One of these engines could take up nineteen wagons, weighing, when loaded, about 11 tons each—making a total gross weight of train, behind the engine, of 200 tons—at 10 miles per hour. The greatest load that had been taken was twenty-one wagons, of a gross weight of 230 tons, at five miles per hour. The average ordinary train taken up the incline, consisted of eighteen wagons, each weighing 8 to 11 tons gross; the total weight being, say, 160 tons gross, at 10 miles per hour; but excursion trains of loaded carriages, weighing, when empty, 5½ tons each, and 7½ tons when loaded, making a gross load of, say, 200 tons, had also been taken up. The resistance of the train indicated on the piston, after allowing for gravitation on the incline, amounted to 13 lbs. per ton gross of engine, tender, and

trains, which contrasted favorably with the estimated traction resistance of 150 lbs. per ton gross on the American incline.

With reference to the influence of curves upon resistance, it had been found that, at a speed of 45 miles per hour, the traction resistance was greater, by 20 per cent., on a line having curves under one mile radius, at the rate of one curve in $2\frac{1}{2}$ miles, than on a practically straight line.

It was remarked, that the Whitstable branch of the South Eastern Railway, on which there was a gradient of 1 in 30, had originally been worked by stationary engines and rope traction; but as the traffic was intermittent, it had been determined, some years ago, to substitute locomotive power, and this application had been quite successful. Bury's four-wheel coupled engines, having cylinders 14 inches in diameter, with a length of stroke of 24 inches, the wheels being 4 feet 6 inches in diameter, were still in use on this branch. Four trucks of coal were taken up the incline of 1 in 30,—the gross weight, including the engine and tender, being about 50 tons.

On the Folkestone Branch of the same line, which had an inclination of 1 in 30 for upwards of three-quarters of a mile, four-wheel tank engines, constructed on Mr. Crampton's plan, were employed. The four wheels of $4\frac{1}{2}$ feet diameter were all coupled; the cylinders were 16 inches diameter, with a length of stroke of 24 inches; the weight of the engine was $26\frac{1}{2}$ tons, and the pressure of the steam was 120 lbs. per square inch. These engines had taken up the incline a load of fourteen carriages, equal to a gross weight of 100 tons, including the engine.

It was believed that the peculiar construction of the engines and carriages in the United States, tended to lessen the resistance of curves. It was well known that, in New York, and in other American cities, the railways were brought into the streets,—horse power being then employed,—and that the trains were conducted round the turnings of streets with great facility. As to the cost of construction of American railways, it appeared from official returns, which had been carefully compiled, that in the State of Massachusetts, the cost of the principal lines had amounted to £10,599 per mile, or £9489 per mile, exclusive of rolling stock. In the State of New York these figures were respectively £11,200 and £9762 per mile. It should be stated that a large proportion of the American railways consisted of single way, and that their cost ranged between £5000 and £14,000 per mile.

The Manchester, Sheffield, and Lincolnshire Railway, with a gradient of 1 in 130 for upwards of 22 miles, was mentioned as a case of a main trunk line, upon which there was a large traffic, necessitating the employment of heavy engines. Ordinary inside cylinder engines were employed,—the cylinders being 18 inches in diameter, with a length of stroke of 24 inches; the wheels being 5 feet in diameter, all coupled. They weighed, when in working order, 31 tons, were worked at a pressure of 130 lbs. to the square inch, and would draw a load of forty wagons, weighing 130 tons, independent of the weight of the engine and tender.

The great feature in the paper under discussion was thought to con-

sist in the statement, that two-fifths of the weight of the engine had been obtained as adhesive capability; whereas, in this country, one-fourth had been considered as much as could be relied on, in all states of the rails. On the West Cornwall Railway, loads of about 13 tons had been conveyed up an incline of 1 in 13, for a distance of from a half to three-quarters of a mile. The engine had four wheels coupled, and cylinders 13 inches in diameter. This plan had been considered preferable to the employment of stationary power. On the South Devon line there were gradients varying from 1 in 41 to 1 in 51, with S curves of 15 chains radius. As a practical fact, it might be recorded, that the engines would take seven loaded wagons up an incline of 1 in 41, on straight portions of the line; but when they came to curves of 15 chains radius, one of the wagons had to be removed.

It was stated that, on the Lickey Incline of 1 in 37½, an engine had been allowed to attain a speed of thirty miles in descending, and it was then brought up in 30 seconds, by the application of a peculiar kind of brake to the wheels of the engines.

With regard to zigzag inclines, for traversing mountains, it was stated that the late Mr. George Stephenson had suggested their adoption, thirteen years ago, on a line in Spain. Mr. Drane had also recommended that this method of crossing high mountains should be adopted in Ceylon; and more recently, as was well known, Mr. I. J. Berkley, M. Inst. C. E., had carried out the system successfully on the Great Indian Peninsular Railway, for ascending the Bhore Ghaut. It was thought that they were only desirable under special circumstances and in peculiar positions, where it was impossible to make a continuous line except at great cost, or by the introduction of excessively sharp curves.

Probably the steepest gradients in this country over which a large traffic was conveyed, were on the line between Manchester and Oldham, a distance of seven miles. For a mile and a quarter there was an inclination of 1 in 48 or 1 in 50. The line was then tolerably level, until, on approaching Oldham, gradients of 1 in 30 and 1 in 39 were encountered, and for about a mile and a quarter 1 in 27. This latter incline had originally been worked by stationary power and rope traction; but about five years back the locomotive had been substituted, and no difficulty was found in taking up considerable loads.

In closing the discussion, the circumstances under which steep inclines could with propriety be adopted, were considered; and it was remarked that, as a mechanical question, there was no difficulty in apportioning the power of the engine to the amount of adhesion required to traverse a particular gradient. But inclines of 1 in 10 or 1 in 17, or even 1 in 40, would only be resorted to from necessity, as such gradients were attended with a heavy cost for working expenses. On a branch of the Stockton and Darlington Railway, where there was an exceptional gradient of 1 in 40, although the traffic was all down hill, the whole of the receipts of that portion of the line, taken at one penny per ton per mile, were absorbed by the working expenses. If the loads had been up hill, it was believed that the working

expenses alone would have amounted to three pence per ton per mile, and, with gradients of 1 in 17, it was thought that this must reach one shilling to eighteen pence per ton per mile. In fact, it was questionable, under such circumstances, whether horse power and carts would not beat the locomotive in point of economy; though, of course, on a long line of railway, it would be most undesirable to introduce a break of gauge. It was undoubtedly more economical to employ locomotive power on the Whitstable branch, where the amount of traffic was so inconsiderable. On the Oldham incline, the necessity of preserving an unbroken communication was a justification for the use of the locomotive, the cost of which, in such a case, must be considerable. On the incline of 1 in 26, near Liege, a perfect system of stationary engines had been in use for many years. The Belgian Government, feeling the inconvenience of that system, had abandoned it, and substituted the locomotive; but such was the uncertainty of the power, in meeting the inequalities of the incline, that the stationary engines had been again resorted to.

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*American Railways.**

An impression prevails in London that American railways are in reality, notwithstanding their fair dividends, poor properties, because the iron of which they are constructed is comparatively bad—bad as compared with the metal generally used for the rails of our lines.

It is, no doubt, the fact, that the rails of American lines generally are indifferent stuff. The iron had to come from this country; and being paid for in bonds, it is said the iron-masters took advantage of their position, and palmed off on the "Yankees" inferior material. It may be remarked that they did the same in some of our modern English railways. But let that pass. Admit that the American railways are composed of poor rails. As a question of £ *s.* *d.*, what does it amount to? It amounts to costly working. Nothing more. The cost is annual, and it resolves itself into an enlargement of the working expenses. Be it remarked that the American lines, as compared with the English, are extremely costly in working, which Messrs. Zerah Colburn, and Alexander Holley, two distinguished authorities, ascribe principally to this very defect of the permanent way. The dividends of American railway stocks would doubtless be higher were they to substitute good rails for bad, which we may expect they will do as they have now found their error out. The additional cost would not be much, comparatively speaking, and they would soon make it up in savings of working expenses. According to the last Board of Trade Report of English railways (by Captain Galton) the average working expenses of heavily taxed British railways were 47 per cent., while those of American railways were 54 per cent.

If American railways were as substantial as our English lines generally are, they would yield even higher dividends than they now do. Their capital accounts would not, as we have said, be much increased, while their savings in working would pay a high per centage on the additional capital. Notwithstanding their extremely high rate of expense

* From Herapath's Journal, No. 1022.

for working, the American lines in 1857 yielded a traffic profit on their capital of 6·7 per cent., while the British railways in 1857 yielded only 4·11 per cent. Thus as a property, the American lines are now more than 50 per cent. better than ours; but if the condition of their rails, &c., admitted of as much economy in working, they would be better still. They have the great advantage, which nothing can take away, of economy in capital outlay, such as avoiding frightful law, Parliamentary land compensation, and other expenses, which in this country have run away with capital wholesale without purchasing any substantial property. Nearly every old American line could not now be made for what it originally cost, the land and labor having so much advanced in value.

Some of the best paying new English railways, and there *are* paying new lines here, have been laid with poor iron, which detracts from their value but does not destroy it. They would have been better properties had they been blessed originally with better iron, the badness of which adds and will add for years to their working expenses. In course of time good rails will be substituted for defective ones, and then the profits will be as they originally would have been had the construction been fair in the first instance. Let it never be forgotten that such a thing as a *worn-out* sound rail is almost unknown. Extremely heavy rails are no good. They are destroyed as soon as lighter ones, if they are unsound. Get rails of the best material, and well laid, and no amount of traffic will produce any sensible effect upon them during a long series of years or in a life time. Ask the Stockton and Darlington Company their experience in the matter.

We have written these few remarks to correct the popular but really very silly notion that American railway dividends are unsound because their rails are unsound, the truth being that the dividends would increase were the permanent way in better order. The American heavy repairs and renewals are charges against their current revenue accounts.

"*Account of Experiments upon Elliptical Cast Iron Arches.*"*

By T. F. Chappe, M. Inst. C. E.

[Read before the Institution of Civil Engineers, March 15, 1859.]

These experiments were undertaken at the request of Mr. W. H. Barlow, M. Inst. C. E., for the purpose of ascertaining practically the safe load to which elliptical cast iron arches might be subjected, as well as the most economical distribution of the metal. The intrados of the arches was in all cases a segment of an ellipse, in order to obtain the greatest headway at the haunches. The experiments were, in each case, conducted upon two ribs, placed two feet apart from centre to centre, and resting on cast iron abutment pieces, keyed-up tight against the springings. Diagonal stays and longitudinal struts were also introduced to prevent lateral motion.

* From the Lond. Civ. Eng. and Arch. Journal, April, 1859.

The first experiment was made upon a model, one-fourth the real size, of one arch of a bridge intended to be erected over the river Trent near Newark. The (model) arch had a clear span of 14 ft. 6 in., and a rise of 16 inches; a camber of $\frac{1}{4}$ of an inch being given in fixing the halves together. The sectional area of the arch at the crown was 2·43 inches, —that of the curved rib near the springing 2 inches,—about midway between the springing and the crown 1·75 inch, and of the spandril 1·34 inch. The weight of each arch was 1 cwt. 2 qrs. 22 lbs.

The other experiments were made upon a model, one-sixth the real size, of an arch erected over the Gloucester and Stonehouse and Great Western Railways, at Standish, six miles from Gloucester. The dimensions of the model were—span 13 ft. 10$\frac{3}{8}$ in., and rise 1 ft. 10 in. The sectional area at the crown was 1·25 inch, of the curved rib near the springing 1·055 inch, about midway between the springing and the crown 0·993 inch, about the middle of the upper rib 0·883 inch, and of the spandril 0·57 inch. The weight of each arch was 3 qrs. 26 lbs.

The following pressures were given as those to which the arches were subjected in these experiments:—

Experiment.	Ultimate load.		How distributed.	Pressure per square inch of sectional area.	
				At crown.	At smallest section.
No.	Tons.	cwt.		Tons.	Tons.
1	30	10	Uniformly.	8·52	11·83
2	18	0	"	6·80	8·58
3	12	0	Partially removed from the haunches.	4·54	5·72
4	5	0	On one haunch.	2·36	2·98
	3	12	At centre.	2·93	3·70
5	3	14	"	3·00	3·85

In the first experiment the ultimate pressure was not reached. In the second and third experiments one-half the arch was out of line laterally, beyond what would be permitted in practice, and was wanting in that assistance which would have been afforded in the number of ribs required for the width of a bridge, so that the ultimate pressures indicated were below what such arches might be estimated to bear. This was also the case in the two last experiments, in which the castings were faulty, and the tests such as were not likely to occur in practice. It was thought that cast iron arches of the form experimented upon, might safely be considered capable of bearing a pressure of between 8 and 10 tons per square inch of section. From the position of the fractures it was believed that the spandrils were too weak in proportion to the size of the arches.

The communication was accompanied by several tables, showing the deflections on the application of the different loads.

AMERICAN PATENTS.

List of American Patents which issued from March 29 to April 12, 1859, (inclusive,) with Exemplifications.

MARCH 29.

328. Friction Belt for Flour Mills; L. S. Reynolds, Indianapolis, Indiana.

Claim—1st, The sliding knockers, in combination with the shaft, ribs, and rods, when constructed as set forth. 2d, The springs, in combination with the knockers, when operated as set forth. 3d, The elastic bridge-tree, when used as set forth.

329. Cultivators; T. A. Robertson, Washington City, D. C.

Claim—The wing extended obliquely from the rear standard to a point, from which point projects a straight portion or divider, in combination with the oblique cutting bar, as described.

330. Stoves; H. R. Robbins, Baltimore, Maryland.

Claim—The combination of the fire chamber with the inclined front encircling transparent face plate, heat plate, pedestal with its doors, upper back encircling chamber with its doors, and divided horizontally, smoke and heat pipes, and back case or reflecting bonnet, having a conduit arranged to conduct air to the one perforated passage of the upper back encircling chamber, as described.

331. Cotton Press; J. G. Roux, Raymond, Mississippi.

Claim—The rotating platform provided with helical ledges or rails, in combination with the blocks placed on the ledges or rails, the levers, attached to the follower and the stationary press-box, arranged as set forth.

332. Railroad Cattle Guard; J. L. Rowley, Angola, Indiana.

Claim—The springs and bar, in combination with the chain fender and post, when constructed in the manner described.

333. Harvesters; I. S. and H. R. Russell, New Market, Maryland.

Claim—The peculiar arrangement of two segment level wheels, two spur wheels, an independently turning hub, having a slotted plate attached to it, and a crank arm, having a turning crank pin for giving motion to the rake round the reel in the path of a vertical circle, and over the platform in the path of a horizontal circle, as set forth.

334. Forging Machine; Erhard Schlanker, Buffalo, New York.

Claim—That portion of the hammer shaft from the centre pins extending towards the driving shaft, to be used as a lever in controlling the hammers, the centre pins being the fulcrums in connexion with the wrists and friction rollers, the location and position of the spring cams upon the duplicate face plates. The sections and the independent operating crank cams, guide plate, cranks, levers, and connecting rods, as described.

335. Coffins; I. C. Shuler, Amsterdam, New York.

Claim—1st, The manner of forming a recess in the sheet metal all around the base inside of a metal coffin; also, the arrangement of placing an iron frame, or its equivalent, into the recess described, fastening it firmly to the sheet metal all around the body of the coffin, for the purpose of stiffening the lower edges of the same. 2d, I do not claim the ribs separately, as I do not consider them tenable, but the ribs being peculiarly arranged by being placed under the flanch which supports the rim, and fastened to the frame in the recess at the bottom—I claim this peculiar arrangement for the purpose of stiffening the sides and end, so as to sustain a heavy weight of earth; also, for the purpose of preventing the sides from bilging out, when the handles are placed about an equal distance between the upper and lower edges of a sheet metal coffin. 3d, The arrangement of pressing or rolling around the outer edge of the cover of a sheet metal coffin, an inverted bead which forms a tongue on the bottom side of the cover, so arranged as to fill the groove in the upper surface of the rim, for the purpose of soldering or cementing the joints. 4th, The arrangement of placing a galvanized iron rim, or its equivalent, on the outside and over the upper edge of the walls of a sheet metal coffin, fastening the same permanently to a flanch formed all around the upper edge of the walls, for the purpose of shaping and strengthening the upper part of the coffin, and at the same time furnishing a means of securing the coffin top at the joints. 5th, I am aware that I have claimed in a former patent an iron frame as a cover over the soldered joints on the top of a sheet metal coffin; I therefore disclaim it as an entire frame: but I claim the bi-section of the frame and its re-connexion by means of spring catches at the widest part or break of the coffin.

336. Cultivator; John Smally, Bound Brook, New Jersey.

Claim—The frame, its adjustable pole, its teeth and detaching teeth, the cranked shaft, its central lever, and driver's seat, when the said seat is so situated as regards the handle that the driver can operate the latter without moving from the seat, and when all the parts are arranged in respect to each other, as set forth.

337. Seeding Machines; Michael Simmons, Ira, Illinois.

Claim—1st, The use of the eccentrically cut gear wheel, so as to enable me to get my pinion and pinion shaft on top of the frame, and above the centre of the wheel that drives it. 2d, The arrangement of the beams with their skewed shovels and adjustable connects, so that they may be transposed from side to side of the machine at pleasure, in the manner explained.

338. Spring Bedstead; C. F. Spencer, Rochester, New York.

Claim—The combination and arrangement of the spring slats with the bars and fulcra, the latter arranged to increase or diminish the effect, and horizontal slats resting at once on the free ends of each reverse series, in the manner described.

339. Smut Mill; G. H. Starbuck and D. D. Gilman, Troy, New York.

Claim—1st, The combination of the two scouring plates placed one above the other, with their roughened or burred surfaces toward each other, in combination with the funneling plates for depositing the grain at the centre of the scourers, between which it is passed, forming a double scourer attached to, and revolving with, the shaft, operated in the manner set forth. We do not confine ourselves to any number of scourers for a machine. 2d, The vertical cylindrical opening, in combination with the outer case, screen, and fans, for the

purpose of giving free discharge to all light impurities and foreign matter, and preventing the discharge of grain.

340. WATCHMAKERS LATHE; R. H. St. John, Bellefontaine, Ohio.

Claim—The combination and arrangement of the steel ring, spring, set-screws, and centering plate, as described. Also, the employment of the screw cap for clamping the article to be centered, in the manner specified.

341. CULTIVATORS; J. C. Stoddard, Worcester, Massachusetts.

Claim—1st, The share and wings or blades arranged relatively with the wheel or wheels, that is to say, placing the wheel or wheels behind the share and between the wings or blades. 2d, The adjustable rotating scrapers applied to the wings or blades. 3d, The combination of the lateral adjustable hoes, share, adjustable wings or blades, rotating scrapers, wheels, one or more, arranged as set forth.

342. CRESSET FOR HEATING BARRELS; John S. Thompson and Marvin J. Seymour, Glenn's Falls, New York.

Claim—The arrangement of the annular bed at the base of the apparatus and above the escape flue, to receive and support the barrel.

[This invention consists in having an upright cylinder or drum attached to an ordinary box stove, the stove and drum being provided with a return flue, and the stove with an annular bed.]

343. MACHINES FOR DIGGING POTATOES; J. C. Stoddard, Worcester, Massachusetts.

Claim—1st, The weed eradicator formed of the vibrating plate with serrated flanches, attached and arranged as set forth. 2d, The inclined adjustable screen box provided with a share and spur at its lower end, in combination with the endless chain of carriers arranged to operate in grooves. 3d, The combination of the weed eradicator, leveling share, inclined adjustable screen box, with share attached, and endless chain of carriers, with or without the receptacle. 4th, The adjustable or movable roller shaft applied to the machine, and arranged as set forth.

344. MANUFACTURE OF WOOD SCREWS; N. G. Thom, Cincinnati, Ohio.

I do not confine myself to any particular form of construction as to size, shape, &c., as these may be varied indefinitely, and the same construction is applicable to coach or lag screws, or any other screw in which wood, or other yielding substances, constitute the material into which the screw is driven.

Claim—The described wood screw, which consists in its having two or more parallel threads that terminate at or near the point of a tapering core, as described.

345. SADDLES; S. E. Tompkins, Newark, New Jersey.

Claim—The bow-pieces, connected with the sides and provided respectively with the head and cantel, in connexion with the central bow-piece or "safety guard," when the parts are placed relatively with each other, so as to admit of being cast in one piece. Further, in connexion with the saddle-tree, formed as above, the crupper loop attached to the cantel bow-piece, by means of the plate.

346. STOVES; F. E. Tupper, Nashua, New Hampshire.

Claim—The arrangement of the air chamber with its air passages or tubes and apertures, and openings, with the casing, supporting, and deflecting collar, in the manner set forth.

347. HARVESTERS; S. W Tyler, Greenwich, New York.

Claim—Giving such a shape to the portions, a and b, of the finger-bar, and to the flanched portions or heads of the fingers, that the same set of rivets will unite all the said parts with each other into a fingered bar of unusual stiffness, strength, and narrowness, and at the same time form a dovetail groove for the reception and guidance of the cutter bar.

348. MACHINE FOR ROLLING WHEEL TIRES; Nathan Washburn, Worcester, Massachusetts.

Claim—The combination of a set of reducing rollers, a series of adjustable carrying rollers, and a frame or holder, supported so as to be capable of rising upward within the wheel tire in proportion as the diameter of the inner periphery of the said tire may increase during the process of rolling the tire, and having the said carrying rollers arranged and made adjustable with respect to it and the reducing rollers, in manner specified.

349. CLOD CRUSHERS; E. B. Way, Jerseyville, Illinois.

Claim—The employment of the oblique-sided double tapered slats, in combination with the rims, so that the clods that wedge between the slats will be carried up, and then dropped, and broken within the wheel.

350. SAUSAGE-STUFFER; John Wagner, Pittsburgh, Pennsylvania.

Claim—The arrangement of using in addition to the operating crank for the forward motion, another operating crank for the backward motion, when applied to the wheel gear arrangement of worm and wheel, in the manner described, viz: when set on the spindle of the screw wheel.

351. HARVESTING MACHINE; Wm. Webber, Jr., and John Webber, Rockton, Illinois.

Claim—Operating the rake of a harvester by means of the horizontally oscillating arms, the rod, and the latch, arranged in the manner set forth.

352. STOVES; J. Whitehead, South Paris, Maine.

Claim—The combination with the fire chamber described, and with an oven having hollow walls filled in with a non-conducting material, of a removable fire chamber casing, which has hollow walls, filled in with a non-conducting material, and is in shape, externally, nearly the counterpart of the fire chamber, and serves for encasing the whole of the exposed portion of the fire chamber, and at the same time allows access to the holes in the top of the fire chamber and to the fuel door thereof, as set forth.

353. FLY-TRAP; Elisha D. Blakeman, Assignor to Jacob J. and Levi Auchampaugh, New Lebanon, New York.

Claim—The combination and arrangement of the poison cups with the conical chamber and bed-plate, as set forth.

354. MACHINE FOR ROLLING IRON; Henry B. Comer, Assignor to self and Joseph S. Lewis, Temperanceville, Pennsylvania.

Claim—Furnishing rolls which are placed in front of each other and on parallel lines with guides placed between each set of rolls, said guides being so constructed that they will guide and change the position of the iron as it passes from one set of rolls on to another set, as described.

355. FOOT-SCRAPER; W. L. Williams, City of New York.

Claim—The employment or use of the scraper and the brushes, either with or without the brush, arranged as set forth.

356. METHOD OF OPERATING THE KNIFE IN RIVING SHINGLES; John Wood, Brooklyn, New York.

Claim—Giving the frame in which the reciprocating knife gate is placed an intermittently vibrating movement simultaneously with the feed movement of the bolt.

357. SELF-FEEDING PRESS FOR PRINTING CARDS AND BILL-HEADS; Nathan Ames, Saugus, Assignor to self and Nathaniel Evans, Jr., Boston, Massachusetts.

Claim—1st, The little cams or projections arranged in reference to the ink rollers, and operating in connexion with them and the vibrating type-bed, as described. 2d. The combination and arrangement of the spring, hinged piece, type-bed, and spring, in the manner set forth. 3d, Attaching the type-bed at one of its sides only to the arm, so that the inking rollers may pass over and under it. 4th, The pitman, r′, screw, r, top piece, x, slot, j, and slides, e e′, when arranged as set forth. 5th, Attaching the feeding plate, f, to the slide, e, and causing the latter to move in the groove, g, so that while the upper side of f, bears on the surface of x, the thickness of e extending below it, prevents the card from ever getting between the surfaces of f and x. 6th, The adjustable guide, arranged as described. 7th, The adjustable lateral guides, arranged as set forth. 8th, The card-pusher provided with the slots, in the manner described.

358. CAR COUPLING; James W. Carrier, Assignor to self and Able B. Howe, Springfield, Massachusetts.

Claim—The sliding bunter, A, connexion pin, d, pin, p, springs, r and l, straps, m, sliding pin, B, springs, k k, rack, f, pinion, g, ratchet, s, pawl, t, and pin, v, arranged as described.

359. CORN SHELLERS; Charles W. Carter, Westville, Indiana, Assignor to Lester L. Bond and George Coatsworth, Chicago, Illinois.

Claim—The sectional truncated cone, constructed with the pintle, guide spring, and hinge, and arranged to operate in combination with the outer cone, in the manner specified.

360. MACHINE FOR PREPARING MOULDINGS FOR PICTURE FRAMES; Eleazer Gardner, Assignor to Gardner & Decker, City of New York.

Claim—The revolving rollers, arranged as described, in combination with the scraper, for the purpose specified.

361. RETORTS FOR DISTILLING COAL OIL; Joseph E. Holmes, Newark, Ohio, Assignor to self and Joseph Palmer, City of New York.

Claim—1st, The combination with the internal vapor pipe of a leg, so applied as to keep the month of the said pipe in the upper part of the retort, either by the direct action upon it of the force of gravitation, or by its dragging in the coal or other matter in the lower part of the retort. 2d. The arrangement of the steam pipe to communicate through the hollow journal, with a passage in the leg of the vapor pipe, for the admission of steam directly into and among the charge.

362. CAMERA STANDS; Henry J. Lewis, Brooklyn, New York, Assignor to self and Richard A. Lewis, City of New York.

Claim—The combination of the braces and screw clamping blocks, or their equivalents, with the legs, in the manner specified.

363. MILK PAN; E. L. Pratt, Assignor to self and R. B. Fitts, Philadelphia, Pennsylvania.

Claim—A pan with a detachable or hinged cover, forming, when combined, a vessel closed, with the exception of a series of minute perforations below for the access of cold air, and a suitable distance above the latter, another series of perforations for the exit of warm air and gases, and otherwise constructed as set forth.

364. SEEDING MACHINES; Alonzo R. Root, Assignor to Rufus S. Rickey, Keokuk, Iowa.

Claim—1st, In combination with the hopper and the revolving tubes or arms, the regulator, constructed as described. 2d, In combination with the regulator and revolving tubes or arms, the vertical and inclined partitions and lip, for the purpose of directing the seed to be sown from the hopper to the openings in the arms or tubes, and to prevent the seed from escaping unduly through the arm or tube, for the time being, immediately under the lamp.

365. GRINDING MILLS; George Selser, Assignor to self, J., and W. Cook, Philadelphia, Pennsylvania.

Claim—Attaching the hollow steel burr to the spindle, by screwing or otherwise securing the end of the latter to a plate, which is fitted snugly to the inside of the burr and shoulder on the spindle bearing on the top of the burr, as set forth.

366. MARINE PROPELLER; John Taggart, Roxbury, Assignor to self and George R. Sampson, Brookline, Mass.

Claim—The conjoint action of two separate rotary or screw propellers, respectively operating or screwing into the water and air, arranged as described, and propelled by a steam engine or motor within or carried by the vessel. Also, arranging the air screw propeller on its axis, at an inclination upward from the keel or plane of flotation of the vessel, in order that the said propeller, while being rotated, may operate, not only to draw the vessel ahead, but to lift her bow more or less out of water.

367. GAS RETORTS; Davis L. Weatherhead, Assignor to self and S. E. Southland, Philadelphia, Pennsylvania.

Claim—The cap with its box or reservoir when arranged in respect to the lower chamber, the upper chamber, and exit pipe of the retort, as set forth.

368. SAW-SET; Olive Ann Brooks, Great Falls, New York, administratrix of the estate of Lebbeus Brooks, deceased, late of Great Falls, aforesaid.

Claim—The arrangement and application of the benders and bending screw together, and with respect to the two handles, as set forth, whereby the centre of motion of the benders is at the place of contact, or the vertex of the angle of their upper surfaces, and no fulcrum pin is employed for the support and connexion of the levers.

ADDITIONAL IMPROVEMENTS.

1. TOOLS FOR TENONING SPOKES; J. J. Croy, Caledonia, Missouri; patented February 3, 1857; additional dated March 1, 1859.

Claim—1st, The adjustable gauge attached to the tube, as set forth. 2d, The employment or use of the temper or set-screws applied to the tube, as set forth. 3d, The gauges, H, fitted in the bars of the clamp cutter head, arranged as specified.

2. LOCKS; H. W. Covert, Assignor to M. Briggs, Rochester, New York; additional dated March 1, 1859.

Claim—The combination of the disc and centre, toothed or corrugated, as represented, for the purpose of

fastening them securely together; but I do not confine myself to any particular size, or shape, or number of teeth, nor to any particular position on the disc or centre.

3. Fly-trap; Wm. Riley, Madison, Miss.; patented April 27, 1858; additional dated March 1, 1859.

Claim—The cover or shade, the rim or front, and the pan, as described.

4. Bedstead Fastening; Oliver Robinson, Rochester, New York; patented December 28, 1858; additional dated March 22, 1859.

Claim—Constructing the locking bolt of a flat or rectangular form, so as to work against the surface of the side-board, to obviate the reducing of the bearing surface of the recess of the wrench, and hold the parts to the required position without the usual guide pin. Also, elevating the hooks above a right line through the centre of the bolt. Also, uniting the point of the circular wedge with the stock of the wrench, whereby greater strength and a better adaptation to the recess or seat of the same is secured. Further, adapting the cam or raised part of the wrench lever to pushing and holding forward the bolt for ready connexion with the pin.

5. Railroad Car Stoves; James Spear, Philadelphia, Pennsylvania; patented June 1, 1858; additional dated March 22, 1859.

Claim—The combination of the openings in the side plate with the back fire-plate in connecting tube, with the centre plates, constructed in the manner set forth. Also, the openings in side plate with the centre plate, constructed in the manner set forth. Also, the flue or opening from the front plate to the top plate, constructed in the manner set forth.

6. Cooking Stoves; James Spear, Philadelphia, Pennsylvania; patented July 7, 1857; additional dated March 22, 1859.

Claim—1st, The combination of the cone damper with the smoke-pipe and the top plate. 2d, The combination of the head or deck collar with the cold air pipe and the smoke-pipe, constructed in the manner set forth.

7. Machine for Making Axes; Jonas Simmons, Cohoes, New York; patented March 1, 1853; additional dated March 22, 1859.

Claim—The groove, the arm, with the ton, in combination with each other in the manner set forth.

Re-Issues.

1. Window Fastener; C. R. Edwards, Niagara City, New York; patented July 8, 1856; re-issued March 1, 1859.

Claim—The employment of a single shaft, operated internally, and operating externally upon a window blind, when said shaft is made to effect the double purpose of operating both the blind and its slats, and this whether I construct and arrange the hinge and levers in the manner specified or not.

2. Grinding Mill; G. Sanford, Poughkeepsie, New York; patented March 9, 1858; re-issued March 1, 1859.

Claim—Constructing a grinding mill with flat plates dressed on both sides, having a longitudinal reciprocating, vertical, and oscillating motion, in combination with flat stationary plates likewise dressed on both sides, the whole constructed and operated as described. Also, the notched form of the upper edges of the plates, for the purpose of preventing the mill from choking and to facilitate the feeding of the article to be ground between the grinding surfaces.

3. Handles for Table Cutlery; J. W. Gardner, Shelburne Falls, Massachusetts; patented February 1, 1859; re-issued March 8, 1859.

Claim—Forming the handle of two parts which are encompassed at their junction by a ferule, the tang passing through both parts of the handle and the parts being secured thereon by a nut or washer or a rivet.

4. Machinery for Preparing Oval Pictures; Wm. Gardner, City of New York; patented August 17, 1858; re-issued March 15, 1859.

Claim—A lathe with a face plate revolving in an oval path, in combination with a scraper adapted to the form of the desired moulding of the oval frame, when the said scraper is so arranged as to be self-adjusting laterally with the said moulding.

5. Harvesting Machines; W. A. Kirly, Buffalo, New York; patented September 2, 1856; re-issued March 15, 1859.

Claim—The combination of the single plate and main wheel. Also, the combination of the main wheel, single plate, and rim, when connected together and operating in the manner set forth. Also, placing the vibrating wheel on the outside of the frame, or so that the outside of the frame does not bear on the outside of the wheel, in combination with the triangular-shaped frame on the inside of the wheel. Also, hanging the seat to the plate and to the standard, in the manner set forth. Also, a hinged lever seat and outside stirrup or supporter, in combination with a wheel having no outside frame or support.

6. Machinery for Enameling Mouldings, &c.; Robert Marcher, Cornwall, New York; patented October 21, 1858; re-issued March 15, 1859.

Claim—The employment of a plate whose lower edge is formed the reverse of the transverse form of the moulding to which it is applied, when such plate is made self-adapting to the surface of the molding during the longitudinal movement. Also, the employment of a hopper to contain the composition for enameling when the lower edges of the end plates thereof are formed the reverse of the transverse form of the moulding, and the moulding to be enameled is employed as the bottom of such hopper.

7. Amalgamator; Lewis Solomon, City of New York; patented December 7, 1858; re-issued March 15, 1859.

Claim—1st, The use of elongated amalgamating chambers, when arranged in the manner specified. 2d, The arrangement of the amalgamating chambers within a heated chamber.

8. Steam Gauges; Thomas Stubblefield, Columbus, Ga.; patented July 18, 1854; re-issued March 15, 1859.

Claim—The combination of a case perforated at both ends with a spring valve, the spring forming the sides of the valve being arranged so as to cut off communication between the perforations in the opposite ends of the case, and perform the duty of a manometer spring, as described.

9. Smelting Furnace; Charles C. Alger, Newburgh, New York; patented June 30, 1857; re-issued March 29, 1859.

Claim—Constructing furnaces with the hearth and boshes of an elliptical or elongated form, in combination with the application of the blast at the sides, so arranged as to introduce the blast in the direction of the

breadth, and for the purposes specified. Also, in combination with the hearth and boshes made of an elliptical or elongated form, the construction of such furnaces with two mouths, one at each end, for working and tapping, as specified.

10. Reclining Chairs for Railroad Cars and other uses; Isaac L. Devoe, Staten Island, New York, Assignee through mesne-assignment of Samuel M. Perry, City of New York; patented July 27, 1852; re-issued March 29, 1859.

Claim—1st, To so combine the back with the two end frames by means of bars jointed to it by one or two studs and one or two series of notches, or equivalents therefor, that the said back, when not a reversible one, may be raised and inclined in various positions, so as to not only support the back, but the head of a person at the same time. 2d, Making the back reversible by means ot two series of notches and two sets of studs, or equivalents, arranged on opposite sides of the chair, and made to operate as specified. 3d, The improvement of making each arm or bar with a rack or racks of teeth or succession of notches, or equivalents therefor, for the purpose of adjusting and securing the backs in the desired position, whereby the occupant can alter or vary said position without rising from the seat.

Designs.

1. Stereoscope Case; Alex Beckers, City of New York; dated March 1, 1859.
2. Table Bells; H. C. Foote, Wallingford, Connecticut; dated March 8, 1859.
3. Parlor Cooking Stove; David Hathaway, Assignor to Fuller, Warren & Co., Troy, New York; dated March 22, 1859.
4. Cooking Stove; A. C. Barston, Providence, Rhode Island; dated March 22, 1859.
5. Hat-racks; Edward Reynolds, Assignor to Thomas W. Brown, Boston, Massachusetts; dated March 29, 1859.

APRIL 5.

1. Arrangement for Extinguishing Fires in Steam Vessels; Wm. Arthur, Brooklyn, New York.

Claim—The application of the waste water discharged from the air-pump raised to such height as to flood the steam vessel with water for the purpose of extinguishing fire, instead of discharging it, as usual, as waste water from the sides of the vessel.

2. Machine for Wringing Clothes; S. A. Bailey, New London, Connecticut.

Claim—The employment of the cylindrical wooden spring piece, which is divided in two parts at its centre, each part being slotted from the place of division toward its outer end, the same being covered by a rubber cylinder.

3. Condensing Covers; Abel H. Bartlett, Spuyten Duyvil, New York.

Claim—The reservoir and the pipes, when made and arranged as specified.

4. Apparatus for Exhibiting Stereoscopic Pictures; Alex. Beckers, City of New York.

Claim—1st, Placing the endless belt, chain, band, or apron, in such a position as to form an acute or obtuse angle with the base of the box or chamber of the apparatus. 2d, Placing the slides or frames holding the pictures in such a position as to form acute or obtuse angles with the endless belt or with the line of motion.

5. Metallic Piston Packing; Asa G. Bill, Cuyahoga Falls, Ohio.

Claim—The arrangement of the arms on the central hub of the piston, which act on a ring, and which are operated by means of a cam.

6. Reefing Sails; Robert B. Benson, City of New York.

Claim—Reefing the sail from the deck by the use of a supplementary foot-rope, or its equivalent, in combination with the auxiliary sheet and with the reefing lines.

7. Gas Burners; Wm. Blake, Boston, Massachusetts.

Claim—The arrangement of one or more conduit tubes in the burner or jet chamber, and with respect to the base of the said burner or jet chamber and its inlet passage or passages. And in combination with the arrangement of the inlet conduit or conduits, in such manner as to cause the gas to pass around in the expansion jet chamber in one or more helical currents, I claim an annular or ring exit orifice, whereby the current or currents of gas may be thrown out of the burner in one or more helical streams, so as to equalize the height of the flame and prevent it from flickering.

8. Life-boat; Mannervillett & E. D. Brown, Utica, New York.

Claim—The construction of a life-boat with three recesses, as set forth. Also, in combination with the foregoing, the making a groove in the rudder iron, and a peg in the rudder bolt, for the purpose set forth.

9. Pumps; Wm. R. Brown, Cleveland, Ohio.

Claim—1st, The bi-cuspid valve, constructed as described. 2d, The arrangement of the bi-cuspid valve, in connexion with the oscillating pump.

10. Hydrants; Joel Bryant, Brooklyn, New York.

Claim—1st, In the construction and use of hydrants, the shaft (whether hollow or solid, naked or encased), when used for obtaining water, as described. 2d, In connexion with the said shaft, the perforated open top and banded chamber valve, constructed as described.

11. Paper-folding Machines; Cyrus Chambers, Jr., Philadelphia, Pennsylvania.

Claim—1st, The register pins, so constructed and so attached to a paper-folding machine that they shall retain a position proper for the adjustment of the sheet, and yield by the movement of the latter. 2d, Adjusting one of the register pins laterally and longitudinally, independently of the other pin, by means of the slides, or their equivalents. 3d, Adjusting both pins simultaneously, both laterally and longitudinally, by the frames, X and Y, or their equivalents, the frame X, being adjustable in one direction on the frame Y, and the latter, together with the frame X, being adjustable in another direction on the frame of the machine, or any attachment thereto. 4th, Any convenient number of rods terminating at one of the folding rollers, the ends of the rods passing into grooves in the said rollers, for the purpose specified. 5th, The adjustable stop with its inner edge of a curved or angular form, or otherwise so constructed, that the end of the folded edge

only of the sheet shall be in contact with the said stop, for the purpose specified. 6th, The plunger with its adjustable plate, 8, in combination with the adjustable plate, 9, the said plate being arranged substantially as set forth. 7th, The curved wires, or their equivalents, attached to the machine in any convenient manner, situated under the folding apparatus and adjacent to the trough, for the purpose specified. 8th, The combination of an alarm or indicating apparatus with a paper-folding machine, when the said indicator is operated by a sheet folded by the machine. 9th, Causing the sliding board to move along the trough with a diminution of friction as the folded sheets accumulate, by means of the springs attached to the said board and arranged to bear against the wedge-formed or inclined strips, 5, as set forth.

12. POWER LOOMS; Wm. H. Cheetham, Jr., City of New York.

Claim—1st, The employment of a frame to contain the shuttles which are inoperative, which is constructed to hold the said shuttles, arranged in proper order, in two tiers, and is applied in such a manner in front of either or each set of shuttle-boxes of the loom, as to be capable of receiving in one tier the shuttles which are required to be thrown out of operation, and of supplying from the other tier the proper shuttles to take their places. 2d, The box, M, applied and operating in combination with the shuttle frame. 3d, The pushers, applied and operating in combination with the shuttle frame and box, as described.

13. PUMPS; John B. Christian and Abner Beeler, Mount Carroll, Illinois.

Claim—The construction, arrangement, and combination of the pumping cylinders, G G, and cylinders, B B and I I, in the manner specified.

14. VALVE ARRANGEMENT OF STEAM ENGINES; Henry Clayton, Tamaqua, Pennsylvania.

Claim—1st, The employment, in combination with a slide valve, of one or more shutters applied and secured thereto to vary and regulate the area of opening of the port or ports. 2d, Combining the two shutters (when two are employed,) with the slide valve, by means of two screws, one of whose stems passes through the other, which turns in a bearing on the back of the valve, and both of which stems pass through one end of the valve chest. 3d, The valve with its screwed stem, or its equivalent, and spring, arranged and applied as described.

15. POLISHING RICE; Levi H. Colburn, Baltimore, Maryland.

Claim—The process of breaking the outer covering and moistening the inner coating of rice, and polishing the same, as set forth.

16. STEAM ENGINES; Jacob A. Conover, City of New York.

Claim—Combining with the mechanism which connects the governor with the throttle valve, to regulate the admission of steam to the engine, a mechanism which disconnects the throttle from the governor to permit it to be closed by an independent power, to shut off the steam from the engine, as described.

17. SHOE PEG MACHINE; Caleb Cook, Stittsborough, New Hampshire.

Claim—1st, The discs, as described. 2d, The method of holding the peg-wood together by the chain and drum, and friction appliance. 3d, The method of holding the peg-wood firmly in place by pressing it up against the guide-piece, D, by means of the spring, and the lever and posts. 4th, The method of relieving the upward pressure against D, for the purposes of the feed motion by means of the system of levers, as described.

18. MOLE PLOUGHS; Jacob Creamer and Thomas W. Ricards, London, Ohio.

Claim—The arrangement of the beam, screw, wheel, and shaft, upon the sliding shoe, constructed as described.

19. PUMP; James E. Cronk, Poughkeepsie, New York.

Claim—The peculiar form and arrangement of the diaphragms with the shells, as described, and the ring forming a chamber between them, with the discharge therefrom.

20. MANUFACTURE OF ARTIFICIAL LEATHER; Ephraim and John R. Cushman, Amherst, Massachusetts.

Claim—1st, Holding the felt up to the roll, for the purpose set forth. 2d, Removing the adhering fibres from the surfaces of the felt before it reaches the felt washer, by means of the scratcher, or its equivalent.

21. ICE-PITCHER; Charles Dickinson and Wm. Bellamy, Newark, New Jersey.

Claim—An ice-pitcher provided between its walls with a hard non-conductor, so as to prevent the walls from indentation or fracture from within or without, while it also assists refrigeration, as described.

22. GRATE BARS; James Easterly, Albany, New York.

Claim—The corrugated grate bar, constructed in the manner specified.

23. STEAM BOILERS; E. M. Ivens, New Orleans, Louisiana.

Claim—The arrangement of a cylindrical or annular water drum (having a forced circulation) within the flue of an ordinary flue boiler, in the manner set forth.

24. BOOT-TREES; Winthrop B. Fay and Russell W. Collier, Upton, Massachusetts.

Claim—The elastic plates attached to the sides of the foot-piece in connexion with the adjustable bars, arranged as set forth.

25. BILLIARD TABLE; Fritz Fedderke, City of New York.

Claim—Constructing a billiard which may be changed from an American into a French billiard, by effecting a perfect continuation of the cushion throughout the whole length of the same, by means of cushion pieces inserted between and fastened to the jaws by a handle operating upon a fork lever, latches, or bolts, and springs, and re-converting the French billiard thus formed into an American billiard by renewing the said cushion pieces by the same means.

26. WATER-WHEELS; Josiah B. Fitch, City of New York.

Claim—The combination of the wheels, one or more, and gate, arranged relatively with each other and placed within a proper case, which is fitted within a penstock or flume, as set forth.

27. CLOTHES FRAME; H. M. Fletcher, Newport, New Hampshire.

Claim—1st, The plank, A, in combination with the plank, B, the bearings, and the sectional shafts, constructed as described. 2d, The sectional shaft, constructed and operating as described. 3d, The reel frame composed of the parts, in combination with the sectional shaft, the plank, A, the plank, B, the bearings, with their corresponding mortises, the spring, the pulley, and the cord, constructed as described.

28. MECHANISM FOR OBTAINING ROTARY MOTION FROM RECIPROCATING RECTILINEAR MOTION; Alvin K. Gilmore, Bath, Maine.

Claim—The combination of the bifurcated slider, two pulley sectors, their double pawls, or mechanical

equivalents therefor, and the wheel, the whole applied to one shaft, and made to operate in manner set forth. Also, in combination with the pawls and their disc wheels, the disc-moving mechanism, consisting of the levers, bent arms, sliders, forked arms, slide rod, and shifting lever, arranged as explained. Also, in combination with each double pawl and the shaft, a disc or wheel having studs or stops, and being applied to the shaft and friction wheel, as described.

29. Fire Escape; J. M. Hancock, Lansing, Iowa.

Claim—The flying pinions, in combination with the detent, the driving wheel, the spring-brake, and block brake, as described. Also, in combination with the described piece of mechanism, the table, or its equivalent, as described.

30. Ship Propelling Apparatus; A. E. Harding, Middletown, Ohio.

Claim—1st, The rollers, arranged as described. 2d, The arrangement and combination of the propeller chambers, B B, air tubes, openings, chambers, E E, pistons, gates, pipe, and propellers, arranged as described.

31. Stump Extractor; G. D. Harris, Fitchburg, Massachusetts.

Claim—A stump puller having a pulley and two conical shafts, one shaft for winding the chain with a variable speed, the other shaft for correspondingly winding the rope, and otherwise constructed as described.

32. Rendering Friction Matches Water-proof; L. J. Henry, Assignor to Daniel Benrimo, City of N. York.

Claim—Rendering friction matches partially or entirely water-proof by the application of the melted coating, in the manner specified.

33. Rotary Engine; Daniel Hughes, Rochester, New York.

Claim—The oscillating shoes, applied and operating in combination with the oscillating abutments and the rotating piston hub, as described. Also, the discs, having openings and sockets, applied in combination with the rotary piston hub, the cylinder heads, and the main shaft, as described.

34. Treatment of Peat for Composting; J. Burrows Hyde, Newark, New Jersey.

Claim—The use of peaty matter as a basis for admixture with other richer manures, when said peaty matter shall have been dried and finely powdered, previous to admixture.

35. Rotating Shot and Shells; J. B. Hyde, Newark, New Jersey.

Claim—The use of tangential holes, bored from the outer surface into the solid portion of the front end of the shot, for receiving the rotating composition. Also, the use of the adjustable tubes or cases of rotating composition.

36. Moulds for Forming Artificial Teeth; A. Lewenberg, City of New York.

Claim—A divided socket or holder receiving the pins of artificial teeth, so fitted as to be removable from said pins prior to taking the teeth out of the mould, for the purposes specified.

37. Extension Tables; Anthony Isky, Lancaster, Pennsylvania.

Claim—The arrangement of the pivoted cross slats affixed on each side of the central partition in the table frame and the double wings, when hinged, so that the wing may be turned over on to the slats, when extended, as also the adjustment and combination of the several parts described.

38. Tanning; Hiram Johnson, Farmersville, New York.

Claim—The use of a solution of quick lime as a tanning ingredient to be used in connexion with any of the tannic acids or tanning ingredients now in general use, not confining myself, however, to the exact proportions specified.

39. Lathe Clutch; Wm. Johnson, Lambertville, New Jersey.

Claim—The combination of toothed wheels and arms, actuated by a single screw shaft, so as always to present three several points of pressure centrally upon the body to be turned or wrought.

40. Metallic Cotton Bands; Richard Lewis, Charleston, South Carolina.

Claim—In the device, plates, A B, with slots, projections, opening, legs, and shoulders, in combination, constructed in the manner described.

41. Metallic Cotton Bands; Richard Lewis, Charleston, South Carolina.

Claim—The plates, A B, opening, projections, and shoulders, in combination, constructed as described.

42. Mode of Attaching Horses to Vehicles; E. D. Lockwood, Penfield, New York.

Claim—Attaching the strap to the thills, by means of the perforated plate and the pins placed in the recesses of the thills, and having wide and narrow parts, as described.

43. Water-tight Doors for Marine Safes, Lockers, &c.; M. Ludlam, Fair Haven, Vermont.

Claim—The double door, constructed and operating in combination with the outer or surrounding frame work, and independent interior frame, or its equivalent.

44. Refrigerators; Jacob Marx, City of New York.

Claim—The combination and arrangement of ice chamber, the gutter, pipe, the water-tank, and provision chamber, as specified.

45. India Rubber Soles for Boots and Shoes; Charles McBurney, Roxbury, Massachusetts.

Claim—A sole made of vulcanized india rubber, and having the holes for the reception of the pegs formed in the mould in which it is vulcanized.

46. Sandals; Wm. McConnell, Philadelphia, Pennsylvania.

Claim—A sandal consisting of three blocks of wood, or other suitable material, attached to an elastic metal strip, when the said blocks are so situated in respect to each other, that one shall coincide with the toes, the other with the ball, and the third with the heel of the wearer's foot, as specified.

47. Seeding Machines; O. H. Melendy, Delhi, Iowa.

Claim—The levers, slides, and projections on the wheel, in connexion with the bars connected by the links, arranged as set forth.

48. Steam Boilers; Gregor Menzel, Milwaukie, Wisconsin.

Claim—The arrangement in an upright cylindrical boiler of a fire-box and series of ascending tubes, a smoke-box, a single or double circle of descending tubes, a flue, H, and flue, I, in combination with jacket, with or without horizontal steam dome. I do not claim, irrespective, a circulation pipe for an upright boiler. But I claim the arrangement of my circulation pipes which hang loose and inside the cylinder, openings, and steam dome, in the manner described.

49. LAMPS; A. H. North, Hartford, Connecticut.

Claim—The rotating plate with the elongated scroll teeth, in combination with the vertical gears and the vertical actuating gear, in the manner described.

50. MACHINE FOR MAKING PATTERNS FOR COG-WHEELS, &c.; Washington Obenchain, Logansport, Indiana.

Claim—1st, The mode of adjusting the arm vertically by means of a screw, in combination with the upright, which is also adjustable about a vertical axis. 2d, The track frame when adjustable laterally for the purpose of giving taper to the piece cut. 3d, The arrangement and devices for adjusting the cutter.

51. PUMPS; J. K. O'Neil, Kingston, New York.

Claim—The combination and arrangement of the vibratory arm, rod, stem, guide, and spring, for controlling the valve from the top of the well, as described. Also, constructing the pistons with raised rims and guiding edges upon the heads thereof, in combination with the packing, coiled springs, and central disc, arranged in the manner set forth.

52. ROPE MACHINERY; J. W. Peer. Troy, New York.

Claim—Conducting the strands from their bobbins round the exterior of one side of the flyer, and from thence over guide rods, or their equivalents, to and through a hole or guide on the opposite side of the flyer.

53. PENCIL CASES; D. A. Peirce, East Greenwich, Rhode Island.

Claim—Constructing the end of the tube with a screw-thread, and forming the row of teeth therein, in the manner described.

54. ARRANGEMENT OF MACHINERY FOR OPERATING CORN SHELLERS SEPARATELY OR JOINTLY WITH A FAN OR CUTTERS; W. L. Potter, Clifton Park, New York.

Claim—The arrangement of the fan and the gearing in relation to the shafts, so as to connect and disconnect the same, for the purpose of allowing either the fan or the cutting apparatus to be operated with the sh ller, or the sheller to be worked independently of either.

55. PUMP; John Powers, City of New York.

Claim—Arranging two forcing valvular pistons back to back in line with each other, and combining them by means of a piston rod, or other connexion common to both, with the arm of the brake at a point between the two pistons, so that both may be operated by the same arm of the pump brake. Also, combining the pump brake with the duplex pump barrel, by means of an air vessel, constructed and located so that it forms a secure fulcrum for the brake, and affords a passage through it for the arm of the brake to the piston rod upon which it acts.

56. STEAM BOILERS; Samuel Pierce, Troy, New York.

Claim—The employment of air tubes placed within the fire chamber of a steam boiler, in combination with the surrounding water tubes connected at both ends with the water spaces of the boiler, and connected with the inner air tubes by means of hollow stay-bolts, when the air and water tubes so combined are arranged as specified.

57. MACHINERY FOR LAYING ROPE; G. W. Pitman and W. C. Boone, Bushwick, New York.

Claim—The laying and unlaying of the strands to forward the twist, as described. Also, the ring guide, applied in combination with the bobbin to the nearest flyer, as set forth.

58. CHEESE CUTTER; T. H. Pollock and Daniel Bliven, Greenville, Connecticut.

Claim—The platform being provided with a rim and with projection, in combination with the turn-table, or its equivalent, to operate as specified. Also, the arrangement of the knife, the cutting edge of which makes an obtuse angle with the rack to which it is attached, and operates in combination with slots, in the manner specified.

59. RAIL-SPLICING CHAIRS; R. S. Potter, Chicago, Illinois.

Claim—A clamp wedge operated by the same bolts as a clamp and as a wedge acting upon each rail equally, in combination with the chair guard.

60. MACHINE FOR POINTING AND SPLITTING SHOE-PEGS; Jesse Reed, Marshfield, Massachusetts.

Claim—1st, A traversing carriage, in combination with a revolving table, so arranged that after a series of cuts has been made in one direction, the table may be revolved 90 degrees preparatory to making the second series of cuts. 2d, The device for traversing and returning the carriage, consisting of the following parts, or their substantial equivalents, in combination, viz: the screw shafts, the block, the lever, with its spring and tripping arrangement. 3d, The device for automatically revolving the table, consisting of the spring and the parts, m n o p and k, or their equivalents. 4th, The grooving and splitting irons traversing the block, in combination with the holders, or their equivalents. 5th. Feeding the block by means of the continuous revolution of a screw operating through a spring, so that when the block is released the feed is instantly given to it, in the manner set forth.

61. KEEPING AIR-SPRINGS SUPPLIED WITH AIR; S. G. Randall, Middlebury, Vermont.

Claim—Combining an air-spring and an air-pump, or its equivalent, with a car or carriage, or other moving conveyance, so that the motion of said car, carriage, or other conveyance, shall through such air supplier keep the air-springs supplied with air.

62. AIR ENGINES; B. F. Rice, Clinton, Massachusetts.

Claim—Giving to the plungers or piston of air engines a rotary motion, for the reasons specified. Also, giving to the plungers or pistons of air engines a rotary motion, in combination with the means employed for keeping the entire surfaces of the plungers or pistons continually lubricated, in the manner set forth.

63. BANDS FOR BINDING GRAIN, HEMP, &c.; Andrew Ralston, West Middletown, Pennsylvania.

Claim—Furnishing cords or straps used for binding grain, hemp, &c., &c., with a T-shaped clasp, as described.

64. CAR COUPLINGS; J. C. Ransier, Lyons, New York.

Claim—1st, Clevis, B, in connexion with fulcrum, E, key-bolt, D, for the purpose of a connecting link between railroad cars, so constructed and arranged that said clevis or link will encircle and revolve up and down, and sway to the right and left over the outside of bumper plate or plates and the body of the bumper, and otherwise arranged as described. 2d. Revolving arms, or their equivalents, in combination with the dog, for the purpose of aiding in casting off the opposite clevis from the hook, in the process of disconnecting or uncoupling; also, for a rest for, and in aiding in, throwing clevis on the same bumper forward from its upright

position in the process of effecting a coupling. 3d, Hook, C, or its mechanical equivalent, placed on top of the upper bar, and in rear of the top shoulder of fulcrum, for the purpose of receiving the curved point of the opposite clevis in the process of coupling. I do not intend to confine myself to rod or shaft for the purpose of turning dog, O, against the shoulder of arms, for the purpose of raising the points of said arms, in the process of casting off the opposite clevis in the process of uncoupling, as described, as other well known modes of screw or lever power can be employed with equal effect.

65. Capstan; Jesse Reed, Marshfield, Massachusetts.

Claim—The adjustable detached fleeter, operating as set forth. Also, the employment of the double inclines, whereby I am enabled to fleet the cable, whatever may be the direction in which the capstan is turned.

66. Printers Type Case; T. N. Rooker, City of New York.

Claim—The method of arranging the compartments of a type case, that is to say, placing at the side of the lower case character its corresponding upper case character, for the purposes set forth.

67. Pegging Machine; James and A. W. Sangster, Buffalo, New York.

Claim—1st, The combination of the wheels, P and Q, the ratchet, and the peg-wood, with the awl, peg-driver, the knife, and the shoulder, when arranged substantially in the manner specified. 2d, Placing the adjustable wheel in arrangement with those parts which form the subject of the first claim, for the purpose of regulating the distance at which the pegs are to be driven from the edge of the leather or material pegged.

68. Machine for Making Hoes; Henry Sauerbier, Newark, New Jersey.

Claim—The cam lever and the dies, in combination with the lever, the loose pin, and the clamp, constructed in the manner specified.

69. Umbrellas; L. K. Selden, Haddam, Connecticut.

Claim—An umbrella or parasol, having its frame constructed of a rim and stretcher, formed of arms or bars, pivoted and connected together in connexion with the tube, E, and rod, F, arranged as described.

70. Rubber-head for Lead Pencils; W. W. Shaw, Troy, New York.

Claim—A head for lead pencils made of rubber, in the manner described.

71. Breech-loading Fire Arm; T. E. Shull, Millersburgh, Pennsylvania.

Claim—1st, The combination with a fire arm constructed with a stationary and closed breech or breech piece, and with an opening in the barrel to receive the cartridge, of a hinged flap door or lid which opens and closes the cartridge charging aperture. 2d, The combination with a hinged flap door or lid of a sliding collar or sleeve, so that the operation of sliding the collar back will open the flap door or lid, and the operation of moving it forward will close and lock the same, as set forth.

72. Portfolio; H. T. Sisson, Providence, Rhode Island.

Claim—The combination of the barrel, shaft, hooks or teeth, a spring or springs, spring latch, and stop, constructed as set forth.

73. Side-wheel Steamers; A. M. Sprague, Mobile, Alabama.

Claim—Raising the after guards next adjacent to the wheel about the deck and hull of the boat, and also above the forward guard, so as to leave a clear water-way beneath the after guard and immediately abaft of the wheel, for the purposes set forth.

74. Harvesters; W. S. Stetson. Baltimore, Maryland.

Claim—Giving to the frame a back and forth motion upon the axle-tree, said frame supporting at its rear end the axis of the driving pinion, in the manner set forth. Also, the vibrating frame, connected with the rear end of the frame, and having its centre of motion coincident with the axis of pinion. Also, the combination of the shoe with the vibrating frame, by means of the hinge bolt, arranged and attached to the rear of said frame, in the manner set forth, by which combination the knife-bar is made self-adjustable. Also, connecting the adjusting lever with the platform and sliding frame, as set forth. Also, horsing the knife over the platform or in a position at right angles, or nearly so, to the axle by the two movements, substantially as described.

75. Syrup-charging Apparatus; W. C. Turner, St. Louis, Missouri.

Claim—The construction of a machine, so arranged that a uniform and definite measure of any liquid may be supplied to a bottle, or any other vessel, before, during, or after filling the same with soda, mineral, or water surcharged with carbonic acid gas, or other gas, or any other liquid, by means of a pump air vessel, safety valve, charging valve, or charger, constructed and applied substantially as described.

76. Cooking Ranges; H. K. Stimpson, Boston, Massachusetts.

Claim—The combination of the flanches or projections attached to the side plates of the boiler chambers with the grate, constructed so as to admit air to the fuel from below, and hung so as to allow of its free play, and made narrower than the fire chamber, whereby the contraction and expansion of the grate is prevented from injuriously affecting the remaining portion of the range or stove. Also, the use of the sliding covers, in combination with the top plate, arranged as described.

77. Manufacture of Resin Soap; Stephen Strung, Birmingham, Pennsylvania.

Claim—The admixture, compounding, and preparing of the ingredients named, in proportions specified and for the purposes set forth

78. Machine for Dressing Mill-stones; Samuel Teague, Newton, Ohio.

Claim—The adjustable braces when combined with the picks, sliding frame, and levers, constructed in the manner set forth.

79. Manufacture of Iron; Alfred Thomas, Howard Iron Works, Pennsylvania.

Claim—The mixing of charcoal and anthracite metal and forge cinder, in the proportion substantially as stated, and working them together in the puddling or boiling process, or in a refinery fire, for the purpose of making a superior quality of iron.

80. Bedstead; Pelatiah Thompson, Springfield, Ohio.

Claim—The combination of the double series of helical springs with the removable holder strips and series of cross slats operating with their steadying pins. Also, in combination with the series of slats operating with a series of springs, as specified, and the removable holder strip, I claim the series of guiding blocks, when two or more are extended down to prevent the removable strips from jumping.

81. Machine for Jointing Staves; Jonathan Troop, Saintclairville, New York.

Claim—1st, The vibrating frame, F, provided with the clamp bars, h h, and stave-adjusting bars, m, and used in connexion with the gauge-screws, a', arranged for the purpose of properly presenting the staves to the cutters. 2d, The combination of the above named parts with the rotating cutter wheel arranged for joint operation, as set forth.

82. Machine for Cutting Soles for Boots and Shoes; Albert Warren, Jefferson, Ohio.

Claim—A series of pieces covering the bottom of the box, like c c, separated by a straight line through the centre, together with the series of pieces, like B C, with the knife held securely between their crooked edges, and arranged alternately with a toe to the right and left, and covered by the forms, in the manner described, when these devices are combined with the slide, arranged as specified.

83. Egg Pan; Nathaniel Waterman, Boston, Massachusetts.

Claim—The baking pan or arrangement of cups, and a handle at each end of the series, all connected together and cast or founded in one solid piece of metal and with heat passages between the cups.

84. Fastening Iron Bands on Cotton Bales; C. G. Wells, Galveston, Texas.

Claim—The application of the washer, and the mode of fastening the end of the band with it, and thus expediting the operation of baling and compressing bales of cotton or merchandize, and retaining them securely in their compressed form.

85. Valve Motion of Oscillating Steam Engines; G. D. West, Brandywine Hundred, Delaware, Assignor to P. W. J. Neifus, City of New York.

Claim—The combination of arch and lever, for the purpose as set forth.

86. Burnishing Machine; L. S. White, Waterbury, Connecticut.

Claim—1st, So applying two burnishers in a burnishing machine, that they shall operate simultaneously, at opposite points on opposite sides of the article or piece of work to be burnished, and burnish both sides at once; and that during such operation each shall serve to support the article or piece of work, against the pressure of the other. 2d, The combination of the reciprocating and partially rotating shaft and yoke, or their equivalent, and the tool stock, by means of the rods, s s, the arm, k, and rod, l, and arm, m. 3d, The sliding bars, applied in combination with the tool stock carriage, to operate as specified.

87. Variable Cut-off for Steam Engines; D. A. Woodbury, Rochester, New York.

Claim—The combination of the vibrating yoke attached to the valve stem, and the rotary cam or wiper wheel having arc-formed tappets or wipers, the whole being applied as set forth.

88. Method of Sawing Shingles from the Bolt; Wm. H. and George Yates, Chittenango, New York.

Claim—The adjustable bar and the carriage provided with the adjustable dog, connected with the hand lever, arranged as set forth.

89. Steam Engine; James Black, Philadelphia, Pennsylvania, Assignor to George M. and Wm. S. Worl, and said George M. Worl, Assignor to W. S. Worl, aforesaid.

Claim—The arrangement of the cylinder, hoops, and discs or wheels, when said discs are set eccentrically to an axle which pierces the cylinder transversely, and one end of the piston rod of the cylinder is connected with and operates the hoops.

90. Trace Fastening; Anthony Zink, Lancaster, Ohio.

Claim—The metal ferrule provided with a circular groove running in path of a vertical circle, and two slots running at right-angles to the groove, and a metal cap having two lugs on its inner circumference, with a space existing between them and its head, and a plate extending from the circumference of the head some distance into the side of the trace, as set forth.

91. Bedstead Fastening; Levi W. Buxton, Assignor to Josephus Baldwin and L. Kimball, Nashua, N. H.

Claim—The combination of the shoulders on the locking or rail piece, with the notched or serrated circular edges and conical pin. Also, the combination of the hook with the tube or friction roller and stationary pin.

92. Carpet Sweeper; Jacob Edson, Assignor to self and H. F. Gardner, Boston, Massachusetts.

Claim—1st, Holding the rubber tire upon the driving wheel by means of the groove formed in the said wheel, whereby I am enabled to use a cheaper form of soft or elastic tire than would otherwise be possible. 2d, The use of the flap or float, arranged for preventing the escape of dust and the wear of the brooms. 3d, Arranging two sets of brooms on their common shaft in such a manner that they shall cross each other diagonally. 4th, Holding the brooms upon their shaft by sectional adjustable clamps that reach by or overlap each other, whereby, while every portion of the brooms is securely held, they can be adjusted at pleasure or new ones inserted. 5th, Hanging the broom shaft in such a manner by means of the hinge or pivot joint and yielding spring, that the brooms will adapt themselves to any and all inequalities of the surface to be swept, and at the same time perform their work thoroughly.

93. Washing Machine; Wm. C. Grimes, Assignor to self and R. B. Fitts, Philadelphia, Pennsylvania.

Claim—The combined arrangement of the two parallel rock shafts, having the wash-boards attached thereto respectively, and connected together by the flexible apron, in combination with the double curved bottom of the box.

94. Portable Steam Generator; Wm. C. Grimes, Assignor to self and R. B. Fitts, Philadelphia, Penna.

Claim—1st, Making the three distinctively specified parts, consisting of the furnace, the boiler, with its external cylinder and float attached, and the reservoir, so as to be readily separated from each other, and re-adjustable together at any moment, in the manner and for the purpose set forth. 2d, Making the boiler self-supplying (with water), by means of the float and its containing cylinder, arranged in connexion with the boiler, as described, the same operating together in combination with the reservoir, as set forth. 3d, Making the furnace with an annular chamber between the fire cylinder, the outside shell, and the rings, when the same are constructed, arranged, and combined together, and with the other parts of the boiler, so as to cause the air which supports the combustion of the fuel in the said cylinder to pass down through the said annular chamber, before it enters the said fire cylinder, as described.

95. Pyrotechnic Night Signals; G. A. Lilliendahl, City of New York, Assignor to Martha J. Costan, Washington City, D. C.

Claim—1st, Enclosing the necessary charges of pyrotechnic composition for producing signal fires within cases whose sides are composed of thin paper and tin-foil. 2d, Separating the respective layers of composition in the above mentioned cases, by means of thin partitions or discs. 3d, Charging the aforesaid cases with

such proportions of combustible and non-combustible materials as will allow the cases to be all made of the same length, and also enable a socket to be formed at the lower end of each of said cases. 4th, So proportioning the paper and tin-foil portions of the aforesaid cases, that a sufficient portion of the tin-foil will project above the stiff sides of each of said cases, to form, when bent inwards, a metallic covering for the top of the same.

96. Steam Pressure Gauge; James H. Mosher, Assignor to self and Anson T. Colt, City of New York.

Claim—So applying the valves, in combination with each other, that the gauge may be charged while both legs are open to the atmosphere, and that the air above the mercury in the index tube may be caused to have an ordinary atmospheric pressure while the mercury is at zero, and there is only the pressure of the atmosphere on the back leg.

97. Gauging Device Attached to Hand Saws; Wm. McNiece, Assignor to Walter Cresson, Conshohocken, Pennsylvania.

Claim—The back saw with the folding or adjustable blade fitted in its rib or back bar, as described.

98. Mode of Attaching Straps to Boot Legs, Julius A. Pickering, Assignor to William Walker, Milford, Massachusetts.

Claim—Supporting or retaining the loop or upper part of the strap, in the manner described.

99. Faucets; George W. Randall, Assignor to self and Reuben J. Todd, Boston, Massachusetts.

Claim—The combination of the auxiliary or inner tap with the outer tap and the conduit case, provided with two or more conduits, as described. Also, the arrangement of the air passage, so as to discharge with reference to the discharging end of the inner tap, as described.

100. Ship-steering Apparatus; D. J. Wilcoxson, Milan, Assignor to self and Isaac Collins, Huron, Ohio.

Claim—1st, The combination of the double yoke with the traversing nuts, arranged as described. 2d, Arranging the screws by which the rudder is turned on either side and below the top of the rudder post, so that, in case of accident, the tiller may be used to steer the vessel without its being interfered with by the steering mechanism.

101. Hub Borer; Cutting B. Wiley, Adrian, Assignor to self and Alex. Stebbins, Lenawee Co., Michigan.

Claim—The combination of the sliding cutter head with the adjustable ways or slides, with the nut and screw, as described.

102. Pyrotechnic Night Signals; Martha J. Costan, Washington City, D. C., Administratrix of the estate of B. Franklin Costan, deceased.

Claim—The signalizing of any numeral, combination of numerals, or any character, or any combination of characters, by a methodical exhibition of different pyrotechnic fires, substantially as set forth.

APRIL 12.

103. Machine for Noting the Sums of Numbers Added; J. W. Arndt, Green Bay, Wisconsin.

Claim—The arrangement of three indexes on a dial marked with units, hundreds, and thousands, in combination with the swivel arm, the ratchet wheel, and with the pinions, and with the gear wheels, or their equivalents.

104. Projectiles for Fire Arms; Wm. H. Arnold, Washington City, D. C.

Claim—Combining with hollow base projectiles, a shaft split at its extremity, and otherwise constructed as described.

105. Gauging Threads; J. E. Atwood, Mansfield Centre, Connecticut.

Claim—A series of rollers, or other equivalent devices, so arranged that their surfaces combine to constitute a number of gauges through which the thread is conveyed, by suitable means, and by which its thickness is measured at two or more points at the same time, and a multiplied measurement is obtained.

[The object of this invention is to determine the size or thickness of threads, or of the several portions of a single thread, with a view to their being sorted according to their size, more especially for the sorting of silk thread preparatory to its being manufactured into sewing silk by the doubling, or trebling, and twisting process.

106. Gas Regulators; S. D. Baldwin, Milwaukie, Wisconsin.

Claim—1st, The annular recess or chamber, for the purpose stated. 2d, And in combination with a regulator having such recess, the union piece, as set forth.

107. Shutter Operator; J. K. Barker, Lawrence, Massachusetts.

Claim—The use of the block or arc of convenient size to be fastened to the blind or building, as described. Also, arranging the pipes or cords, and opening, shutting, and fastening exterior blinds in the inside of buildings, by means described.

108. Dovetail Joints for Wood, &c.; F. S. Barnard, City of New York.

Claim—The tongued and grooved sectional dovetail joint to connect wood or other material together, in substantially the manner specified.

109. Stereoscope Case; Alex. Beckers, City of New York.

Claim—1st, The picture frames, constructed of elastic wire, or of any other suitable substance, and provided with a hook for adjusting the pictures in the centre. 2d, The arms, arranged in such relation to the pictures, that by the motion of the arms each of the pictures, when brought before the eye-glasses, can be moved to and from the same, until it comes into the proper focus.

110. Pump; A. Beeler and J. B. Christian, Mount Carroll, Illinois.

Claim—The combination of two sliding cylinders with each other and with a third stationary cylinder, arranged in the manner specified.

111. Self-priming Gun Lock; F. Bell, Washington City, D. C.

Claim—The combination of mechanical devices, as described, with the slide, by means of which the latter can be either kept rigidly in position over the mouth of the magazine chamber, thus intercepting all communication with the latter, or be thrown in gear with the lock plate, so that by cocking the hammer it will be

operated in such manner as to force a cap from the magazine chamber into the discharge chamber of the hammer, on the descent of the latter upon the nipple.

112. Grain Separator; Jacob Benner, Alleghany, Pennsylvania.

Claim—1st, The arrangement of the receiving chamber, separating chamber, collecting chamber, and gathering chamber, when used in connexion with the suction fan. 2d, The arrangement of the shutes and valves, when used in connexion with the conical or convex bottom of the collecting chamber.

113. Smut Machines; Jacob Benner, Alleghany, Pennsylvania.

Claim—1st, The use of plate, with the cone and the opening between the lattice work and plate, when used in connexion with the suction fan, the beaters on drum, and the flues, as described. 2d, The arrangement of the chambers, A B C and L, and the flues, in combination with suction fan, lattice work, opening, plate with cone, and beaters on drum, as described. 3d, The use of the straight or perpendicular part, X, with cap of the casing of chamber, A, for the purpose of forming an eddy in chamber, L, as described.

114. Bread Cutter; Hiram Berdan, City of New York.

Claim—The arrangement of the adjustable cavities, in combination with the cutting-off knife, and the large cylinder and piston, and the so connecting the several parts, that the amount of dough displaced by the piston shall be exactly equal to the cubic contents of the cavities presented for filling between each stroke of the cutting-off knife. Also, the devices for rounding up the loaves as they fall from the cavities, consisting of the grooved roller and shield, the roller having a vibratory motion, in the manner specified, in combination with the preceding arrangement of devices claimed.

115. Attaching Thills to Vehicles; Douglas Bly, Rochester, New York.

Claim—The arrangement of the movable piece or block having the notch and screw shank in half, and slightly wedge-shaped, in combination with the oblique shoulder on the notched screw shank, and with the hook of the block, in the manner set forth.

116. Device for Drawing Sawdust, &c., from Stave Machines; Michael Brayer, Rochester, New York.

Claim—The employment or use of the levers, in combination with the inclined bed, arranged as set forth.

117. Fastening for Shirt Studs; Barnes Clayton, Philadelphia, Pennsylvania.

Claim—The armed post, in combination with the cross-piece fixed to the stem of the front piece.

118. Harvesters; Levi H. Colburn, Baltimore, Maryland.

Claim—The spiral-revolving cutter, arranged with a continuous opening through its centre, for the purpose specified.

119. Variable Cut-off for Steam Engines; J. M. Colman, Milwaukie, Wisconsin.

Claim—Combining the double-seated, balanced, or equilibrium valve with the ordinary slide valve of steam engines, as set forth.

120. Cotton Seed Planters; J. P. Crutcher, Silver Spring, Tennessee.

Claim—The rotating hollow chamber, in combination with the clearer and agitator, and swinging frame, as set forth.

121. Hernial Trusses; Josiah Danforth, Middletown, Connecticut.

Claim—Uniting by a screw or rivet the two springs, at a given point from the end of each, with pads attached, which can be adjusted to the body without any additional spring, and thereby making the arrangement and combination of the two springs, with their respective pads, a truss of itself.

122. Churn; Edward L. Dorsey, Green Wood, Indiana.

Claim—The employment of the trundle wheel, staff, pitman, and cog-wheel, for the purpose of giving at the same time a vertical and a circular motion to the dashers for churning butter.

123. Guide Attachment for Vehicles; Nathaniel Drake, Newton, New Jersey.

Claim—The slotted pole strap bar and catch, placed on and connected with the draft pole, in connexion with the cords attached to the catch, passing through the uprights and shieves of the horse collars, and attached to foot levers.

124. Seeding Machines; John B. Duane, Schenectady, New York.

Claim—1st, The arrangement of the vibrating toothed board and agitating bar, connected by the lever, in connexion with the adjustable slide, and perforated bottom, and grooved roller. 2d, The roller when attached to the frame by the bent levers, and connected with the caster wheels through the medium of the bars, arranged as set forth.

125. Artificial Limbs; Richard R. Dutton, Philadelphia, Pennsylvania.

Claim—1st, The use of the hardened cylindrical tube in constructing joints for artificial limbs, substantially as described. 2d, The use of the feather spring, D, when arranged to operate as set forth. 3d, The use of the bolt and pulleys, when arranged for the purpose described. 4th, The use of the spring, O, when so constructed to act substantially as set forth.

126. Oil Cans for Lubricating; Thomas Fields, Media, Pennsylvania.

Claim—Attaching the oil can by means of a clamp to a handle, and using, in connexion therewith, the lever or bar actuated by the cord and slide.

127. Grain Drills; James Ford, Wabash, Indiana.

Claim—The arrangement of the seed-box, E, lever, N, rod, P, slide, S, lever, M, and tilting frame.

128. Covers for Traveling Trunks; Eldridge Foster, Hartford, Connecticut.

Claim—The air-inflated trunk cover, in the manner set forth.

129. Coffee-roasters; Washington L. Gilroy, Philadelphia, Pennsylvania.

Claim—The arrangement of the two sets of the united staying and guiding pieces, B B and B′ B′, on the inner side of the said hollow sphere, each set being placed diametrically opposite to the other, and with their apexes in the direction of the rotary motion of the said sphere, that they may, in succession, operate in combination with the interior spherical curve of the latter, during its rotary motion, to remove the coffee from the middle of the bottom of the said sphere toward the ends thereof, and essentially permit it to fall gradually over the edges of the said staying and guiding pieces into the middle of the bottom again, as specified, thus rendering the said spherical coffee-roaster perfect in its operation, as described.

130. CALLIPERS; Fayette Gould, Huntington, New York.

Claim—In combination with the jaws and graduated bar, the dial plate, and index, the latter being actuated by the pinion and rack.

131. CHAIRS FOR RAILROAD BARS; Henry H. Graham, Paterson, New Jersey.

Claim—The horizontal binder and vertical wedge, in combination with the chair that receives and sustains the ends of the rails, in the manner described.

132. CARPET FASTENER; Marshall Granniss, Waterbury, Connecticut.

Claim—A carpet fastener composed of a plate provided with ears, and a fork or plate having prongs, as described.

133. JOINT-BODIED BUGGIES; Edwin J. Green, Valparaiso, Indiana.

Claim—Connecting the front axle of a carriage to the body by means of a swivel joint, composed of shaft, king-bolt, turning plate, and stationary plate, when the latter is secured directly to the body of the carriage. Also, connecting the front springs to the coupling or reach by means of the shaft, which is welded, or otherwise secured to said springs. Also, in combination with a hinged carriage body, the braces, for the purpose of preventing the rear axle from being thrown angling when the carriage is loaded heavier on one side than on the other.

134. MACHINE FOR THREADING SCREWS; Ira Griggs, Utica, New York, Assignor to the Utica Screw Manufacturing Company.

Claim—1st, So applying the rest and controlling it by a spring, as to provide for its longitudinal movement in, and independently of, the carriage. 2d, Fitting the cutter stock with an eccentric, operated by means substantially as described, to provide for it a movement for tapering the point of the screw, independent of the vibrating movement to feed the cutter, in cutting the other portion of the screw. 3d, And though I do not claim, broadly, a two-pointed cutter, I claim the construction of the cutter with two points, at such a distance apart as to straddle two turns of the thread and the intervening space.

135. MACHINE FOR NICHING HEADS OF SCREWS; Ira Griggs, Utica, New York, Assignor to the Utica Screw Manufacturing Company.

Claim—The arrangement of the holding dies and feeding slider in a carrier, which swings upon the same shaft which carries the cams for operating the said dies and slider, and operates in combination with the notching-saw. Also, the discharging of the notched blanks from the holding dies in a lateral direction, by the introduction of the new blanks into the said dies.

136. MACHINES FOR TAPERING STICKS; H. S. Hall, A. D. Hunt, and C. J. Winchester, Assignors to H. S. Hall, A. D. Hunt, and C. E. Jeffords, Jamestown, New York.

Claim—The rotating cylinder provided with the adjustable bearings and cutter, one or more, when said bearings and cutters are operated through the medium of the plate, bar, with inclined bar attached, and the rack and pinion, in connexion with the springs.

137. ELASTIC POLISHING-WHEEL; Loren Hale, Milford, Massachusetts.

Claim—The hollow elastic ring, operating as set forth.

138. STIRRUPS; Wm. J. Hammersley, Hartford, Connecticut.

Claim—In a saddle stirrup, the employment of the tube, spring, and spindle, for the purpose described.

139. BED-BOTTOM; H. P. Hart, New Woodstock, New York.

Claim—The arrangement of the springs, hooks, and rails or rods, in combination with each other, by which the turns of the hooks are made to form shoulders to support the springs against the pressure of the rods, when these are made to bear directly upon both ends of the springs.

140. PIERS OR BREAKWATERS; Charles T. Harvey, Marquette, Michigan.

Claim—The combination and arrangement of the adjustable bottom-fender or crib with the pier, constructed in the manner specified, the said fender being hinged or so applied to the pier as to be capable of adapting itself to the slope of the bottom in front of the vertical side of the pier, and of protecting the foundation of such pier from the corroding action of currents.

141. HORSE COLLARS; Thomas Harvey, Baltimore, Maryland.

Claim—The arrangement of the parts forming the body of a horse collar, and the construction of an underback, in such form as that the outer edges of the underback, and the face of the collar, and the outer back, are all made perfectly secure by an under seam, and at the same time the under seam is hid from view and wear, as also showing the stitched edge of the outer back in its proper place, all being accomplished previously to the filling of the collar, instead of putting on the outer back after the collar is filled, as in the manner in putting together a case collar.

142. HORSE COLLARS; Thomas Harvey, Baltimore, Maryland.

Claim—The construction and addition of a fancy welt to a welted horse collar, the same being perfectly adapted to its location, being alongside of the usual welt, and so formed as to bring it directly down on the face of the collar, and thus showing a stitched edge, as also being in the proper place to prevent the hame-tug from cutting into the collar.

143. SEWING MACHINES; Wm. Cleveland Hicks, Boston, Massachusetts.

Claim—1st, Transmitting the motion to the needle-stock from that cam or crank on the main shaft which drives the said stock, by means of a pinion interposed between the connecting rod and the needle-stock, and combining the two by rack-teeth cut on each, and meshing into said pinion, whereby I am enabled to impart to the needle-stock the precise motions of said cam or crank. 2d, Setting the feed-wheel or other feeding mechanism, and the shuttle-race, in such position beneath the sewing-table, that the direction in which the materials will be fed and sewed shall be in a line parallel with the bracket arm, and toward or into the bight formed by said arm and the table. 3d, The apparatus for giving out and taking up the slack of the thread, consisting of a partially revolving crank or arm, placed and operated as set forth.

144. ROTARY HARROWS; W. Y. Hildrup, Harrisburgh, Pennsylvania.

Claim—The arrangement of the bars, sliding piece, braces, and draft bar, for the purpose of giving two or more harrows a self-adjusting movement to or from each other.

145. LAMPS; Samuel A. Hill and David Alter, Freeport, Pennsylvania.

Claim—The arrangement and combination of the strip within the cap, as described.

[By this device combustion is retarded, and the fluid within the lamp, as it is converted into vapor by the

heat, is not instantly burned, but is allowed to absorb or become mixed with a requisite degree of oxygen to support combustion, and give a bright illuminating flame without a chimney.]

146. Ploughs; Wm. C. Holmes, Barnesville, Georgia.

Claim—The arrangement of the double beams, hook, cross adjustable braces, shanks, and braces. Also, in combination with the above, the seed dropper, constructed for operation conjointly, as set forth.

147. Stove Covers; Isaac G. Johnson, Spuyten Duyvel, New York.

Claim—The centre-piece, constructed of malleable cast iron, as specified.

148. Knapsacks; Wm. B. Johns, United States Army.

Claim—The construction of knapsacks, so as to be entirely separated from their slings, and with the means of uniting several of them together, and with stitching them, as described, so that the knapsack will perform the double function of sheltering the soldier and holding his kit.

149. Burners for Vapor Lamps; Henry Johnson, Washington City, D. C.

Claim—The generator, burner, and packing-box, constructed in combination with gas pipe and fluid pipe, arranged as described.

150. Machines for Chamfering Soles of Boots and Shoes; Wm. Johnson, Hampstead, New Hampshire.

Claim—The chamfering tool with its sole rest and presser, arranged with respect to the carrier and the knife-holder, as specified.

151. Mortising Machine; Wm. Kegg, Lassellsville, New York.

Claim—The method of feeding along the work, consisting, essentially, of the feeding wedge or wedges, combined with the arms or projections, sliding bolts, and adjustable cams, and arranged with the feeding table, frame, and sliding frame. Also, the adjustable stops and notches in the wedges, with their suspending hooks or staples, arranged in combination with the feeding apparatus. Also, the combination of the double scale, on the face of the feeding table, with the movable or adjustable pointer in the bed-piece. Also, the supporting index standard, in combination with the scale and arrangement for adjusting the bed-piece of the feeding table in position and securing it in place. Also, the "key-tenon," fitting into the oblique groove in the bottom of the feeding table, for the purpose of properly securing and tightening the said table on the bed-piece, while at the same time the desired freedom of its motion is allowed.

152. Stoves; Gilbert J. Kingsbury, Rochester, New York.

Claim—Constructing the fire-pot or furnace so that a portion thereof is flaring or funnel-shaped, yet having side-grates or bars, with perpendicular faces and flame passages, with air tubes, and jets, and grate-cap, when combined with the interior feeding cylinder.

153. Device for Heating Feed-water of Steam Boilers; Samuel Lamon and W. S. Gaskill, Vanwert, Ohio.

Claim—The cylinder, or other suitable vessel, provided with the induction and eduction exhaust steam pipes, and the spiral or helical feed-water passages.

154. Steam Generators; A. B. Latta, Cincinnati, Ohio.

Claim—The method of regulating the circulation of water through the division coils by means of a dividing piece, constructed as set forth.

155. Self-priming Gun; Richard S. Lawrence, Hartford, Connecticut.

Claim—1st, The "shut-off," constructed as specified. 2d, Constructing the driver with its rear portion of about double the thickness of the pellets, and with the wedge-like bevel and the groove, as described. 3d, The combination of the downwardly extended tooth of the cover spring, and the notches in the shut-off, and in the lock-plate, as set forth.

156. Alarm Lock; Henry Lockwood, City of New York.

Claim—1st, The bar, provided with the buttons, connected with the hammer-rod, and arranged with the latch and bolt, provided with projections, as set forth. 2d, The movable or adjustable plate or disk, arranged with the key-holes, and provided with projections to act on the button of the bar. 3d, The combination of the plates or disk and bar, when arranged with the latch and bolt, as described.

[The latch and bolt of the lock are connected with the hammers of a bell, so that an alarm will be sounded if either latch or bolt are operated, and there is another device which rings the bell when the key is applied to the lock.]

157. Railroad Car Seat and Couch; Wm. R. Jackson, Baltimore, Maryland.

Claim—The method of constructing the ordinary reversible seats of railroad cars, so that the backs can be brought down into line with the bottoms; but this I only claim, when the backs, when so brought down, occupy the positions previously occupied by the bottoms, and the bottoms are used to fill the intermediate spaces between them.

158. Harvesters; Gilderoy Lord, Watertown, New York.

Claim—1st, The rake-head, constructed in combination with the endless belt and tripping foot or hand lever. 2d, The combination of the ledge with the spring catch of the rake-head, arranged as set forth.

159. Steam Boilers; Edward Lynch, Washington City, D. C.

Claim—Circulating the water and aiding the generating of steam in the main boilers of ocean steamers, by passing the steam from the steam space of an auxiliary boiler into the water of the water space, below the ash-pit of the main boilers.

160. Steam Engines; Edward Lynch, Washington City, D C.

Claim—1st, The arrangement of the several parts of the engine in their relation to each other and to the propeller shaft, as set forth. 2d, Constructing the connecting rod of one of the cranks or cross-heads, in the manner described, so as to allow of its surrounding the propeller shaft.

161. Folding Life-boat; Henry Martin, Louisville, Kentucky.

Claim—The arrangement of the ribs, one-half of which folds towards one, and the other half towards the other side, in combination with the hinged bottom-boards, which, by means of slots, secure the ribs in an upright position, and are provided with seats hinged to the bottom-boards by means of rods, and connected by the dovetailed projections.

162. Carpet-bags; Jonathan M. Mathews, City of New York.

Claim—The combination of the two frames with the catches, as specified.

163. METALLIC LATH; Joseph W. Mauterstock, City of New York.

Claim—A metallic lathing composed of plates provided with slits, ridges, and furrows, as described.

164. SCREW PROPELLER; James Montgomery, Baltimore, Maryland.

Claim—A screw propeller composed of a plurality of blades attached to their shaft in one frame, or nearly so, when surrounded by a containing cylinder firmly attached to the peripheries of the said blades.

165. MACHINE FOR CORRUGATING METAL PLATES; Richard Montgomery, City of New York.

Claim—1st, Feeding the sheets or plates of metal at the proper time by a feeding device, as described. 2d, The feeding device, in combination with the adjusting pins on the first set of corrugating rolls. 3d, The combination of two sets of corrugating side guides, constructed as described. 4th, The corrugated sweeping and forming roll, constructed as described.

166. ATTACHING IRON ROOFING; T. W. H. Mosely, Cincinnati, Ohio.

Claim—1st, Securing the metallic roofing to the ribs or purlins, so that it may slide or move freely upon and in the direction of the length of the purlins. 2d, Securing the purlins to the rafters of the building, so that they may have freedom of motion in the direction of their length. 3d, The combination of the chairs, double flanched rail, anchors, and metallic roofing, as set forth.

167. REED MUSICAL INSTRUMENTS; E. P. Needham, City of New York.

Claim—1st, Applying and arranging two or more actions, one above another, above the rear portion of the key-board of a harmonium, or other reed instrument, in such a manner that one or more of such actions may be removed at any time, and any one be exposed for repair or other purpose. 2d, In combination with the so arranged actions, the passages, e e, and upright passage, f, arranged to combine the said actions with the bellows. 3d, Combining the several valves, or two or more of them, with the key, by a system of push-pins, or other equivalent direct connexion from one valve to another. 4th, The sound-board, applied to constitute the back of the wind passage.

168. SPARK ARRESTERS; J. F. Page, Philadelphia, Pennsylvania.

Claim—The intermediate casing, with its openings and deflecting plates, when arranged in respect to the chimney, the deflector, and outer casing, as set forth.

169. COFFEE POTS; J. B. Parish, Cleveland, Ohio.

Claim—The fluid valve cover, as arranged with the cup and the helical condensing tube, in the manner set forth.

170. WARDROBE BED; F. C. Payne and A. Reid, City of New York.

Claim—The combined arrangement with a secretary or wardrobe of a bed in the back thereof, in the manner described. Also, the arrangement of the brackets and board, for the twofold purpose of folding compactly to hold the clothes in place, the folding legs, the pulleys, the cord, and weight, as described.

171. WATER COOLER; A. H. Phelps, Trenton, Michigan.

Claim—The arrangement or combination of the tank, the refrigerator, and non-conducting chamber or casing. Also, in combination with preceding, the air chamber surrounding the faucet.

172. TREEING STICKS; L. L. Pollard, Worcester, Massachusetts.

Claim—The described treeing stick, when constructed in the manner set forth.

173. CLOTHES FRAME; Robert Ramsay, New Wilmington, Pennsylvania.

Claim—The combination and arrangement of the standard and the arms, with the bolts, washers, and springs.

174. DIRT SCRAPERS; A. J. Robison, Gypsum, New York.

Claim—The combination of the cam plate with the spring bar for consecutively releasing and retaining the scraper in position, as shown.

175. MODE OF APPLYING POWER FOR EXTRACTING STUMPS AND RAISING HEAVY WEIGHTS; Henry Rieman, Jr., Rogersville, Indiana.

Claim—1st, The combination with the worm shaft and spur-wheel, the arrangement and application of the movable pillow block and wedge to hold the said spur-wheel firmly in position, or admit of its being readily thrown out of gear. 2d, The adjustable supports, adapted, in the manner set forth, to sustain the machine on wheels, to convey it from place to place, and permitttng its deposit on the ground while in operation.

176. MOLE PLOUGH; D. F. Robbins and Simeon Morrison, DeWitt, Illinois.

Claim—Making the beam of a mole plough in two parts, united by a horizontal joint to give it lateral adjustment. Also, connecting the drag (which supports, and upon which the point of the beam is made adjustable, vertically,) to the rear portion of the beam by a hinged joint or connexion, so that the raising or lowering of the point of the plough beam shall not affect the drag.

177. WATER WHEELS; J. S. Rowell, DeW. C. Teller, and M. Lowth, Beaver Dam, Wisconsin.

Claim—1st, The combination of a series of curved guides with the buckets of a water wheel, in the manner specified. 2d, Having the guides curved and fitted to a hub of a wheel, and arranged on a rising and falling governor or spring and regulated capping plate, so as to overhang the buckets and extend down, more or less, over the discharge orifices of the same.

178. OSCILLATING ENGINE; Mark Runkel, City of New York.

Claim—The segment with the projections, in combination with the shell and the abutment, or its equivalent, arranged as specified.

[The steam in this engine is admitted alternately to each side of an oscillating piston, which works in a shell similar to a rotary engine, the change of the direction of the steam being effected by a slide valve. The oscillatory motion of the piston being converted into rotary by mechanical means.]

179. HARVESTERS; Hiram H. Scoville, Syracuse, New York.

Claim—The arrangement of the propelling crank and stationary cam, with respect to the rake bar and universal joint. Also, suspending a swinging apron from the frame work over the platform and in front of the rake.

180. MACHINE FOR SPLITTING SHOE-PEGS FROM THE BLOCK; Winthrop D. Shaw, Tamworth, New Hampshire.

Claim—The feed roller in connexion with the two reciprocating or vibrating knives, the latter being so

operated that one will move slightly in advance of the other, so that the cuts will be given the block successively, and still admit of the proper feeding of the block to the knives—the feed roller being operated by the pawl, rendered adjustable by the attachment of the bent lever to the adjustable bar.

181. Skates; D. H. Shirley, Boston, Massachusetts.

Claim—A sliding heel-piece or clamp, susceptible of being moved forward and back, and fastened at any desired point, in such a manner that the toe of the boot or shoe, being held by a suitable toe-piece or longitudinal binding force, can be brought to bear upon or relieved from the foot.

182. Metallic Coffins; Isaac C. Shuler, Amsterdam, New York.

Claim—1st, The arrangement of fastening the flanch or lower ends of the walls of a sheet metal coffin in a tray or pan, which forms the bottom, and which exceeds the circumference of the walls, by a narrow chamber which may be filled with molten metal for stiffening the base; also, the strengthening bars for stiffening the bottom of the tray. 2d, The arrangement of scrolling or doubling over the flush lower edges of the walls of a sheet metal coffin, soldering consecutively each fold of the sheet metal, thus making a solid rim or flanch of any required thickness, for the purpose of strengthening the base. 3d, The arrangement of placing on the outside of the walls, even with the upper edge, and extending downward any required distance, according to the size of the coffin, a sheet metal rim which may be filled with the molten metal, for the purpose of strengthening and keeping in shape the upper edges of the walls of a sheet metal coffin. 4th, I disclaim an entire frame for covering the joint of the air-tight lid of a sheet metal coffin, with the coffin walls; I also disclaim any bisected sliding cover, these being claimed elsewhere—but I claim the hinged lids as applied to the joint in different sections, for the purpose of allowing a greater number of ornamental breaks in the coffin walls. 5th, The frame for the support of the coffin handles.

183. Fastening for Shirt-studs; Henry Simon, Providence, Rhode Island.

Claim—Shirt-studs, arranged to operate in the manner specified.

184. Harvesters; John Smalley. Bound Brook, New Jersey.

Claim—1st, The combination of the seats, one of which is movable, with the seat frame, elliptical springs, and main frame of the machine. 2d, Constructing the outer piece in the peculiar manner described, viz: with two or more sockets, in combination with the caster-supporting hub and extension piece. 3d, The neck, in combination with collars, groove, standard, and lever, arranged for the purpose of throwing the gearing in and out of action. 4th, Supporting the reel arms by means of the peculiarly constructed hub.

185. Cocks for Water Basins; Horace W. Smith, Hartford, Connecticut.

Claim—The employment of the spring and the grooved and bevel face cam, when acting in combination.

186. Epaulettes; James S. Smith, City of New York.

Claim—The arrangement and combination of the adjuster, fringe, and shell, as described.

187. Grates; Philip Smith, Fall River, Massachusetts.

Claim—Hanging the front plate on pivots arranged so far below the top that, when the bottom is swung out, it will carry in its top and operate the inner upper plate, L. Also, arranging the plate, L, to vibrate. Also, the plates, H and H′, constructed as described. Also, making the plate, L, in separate pieces, fitted together in the manner described.

188. Stoves; Philo P. Stewart, Troy, New York.

Claim—The method of preventing the heat from striking through to the rising flue leading to the chimney, by separating it from the back oven plate, and from the two descending flues, by non-conducting partitions, or the equivalent thereof. Also, in combination with the flue above the oven, and with the rising flue leading to the chimney, the employment of a double-damper filled in with cement, or other equivalent non-conducting material, to prevent the heat from striking through from the top flue to the rising flue. Also, separating the direct flue under the oven from the return flue below by means of a plate lined with cement, or rendered non-conducting by equivalent means, to prevent the heat from striking through to the return flue, and thereby impart greater heat to the bottom of the oven.

189. Tools for Forming Lugs in the Mouths of Bottles and Jars; Amasa Stone, Philadelphia, Penna.

Claim—Making one part of the spindle, which forms the orifice of the jug or bottle, to turn freely, while the other part remains stationary in the nose of the bottle. Also, making one, two, or more scores in that part of the spindle that turns freely, in combination with the corresponding score or scores in that part of the spindle which is stationary, and which aid in forming the orifice in the jug or bottle nose.

190. Stoves; David Stuart, Philadelphia, Pennsylvania.

Claim—The distributing chamber or discharge pipe, r, formed with a central projection, and supplied with heated air from the grate front through pipes, h. Also, the discharge pipe, z, located under the oven, and supplied from the grate front by pipes, k. Also, dividing the grate front horizontally into two series of heating chambers.

191. Cover Lifters in Cooking Stoves; Philo P. Stewart, Troy, New York.

Claim—The lifter, made up of malleable cast iron and wood.

192. Construction of Navigable Vessels; R. H. Tucker, Jr., City of New York; patented in England, December 10, 1857.

Claim—The construction of navigable vessels in the form of isosceles triangles, with vertical sides and flat bottom, the base for that side of the triangular figure which terminates in the two equal angles, constitute the stern, in combination with the air chamber.

193. Rotary Harrows; S. M. Wade, Andover, Ohio.

Claim—The bar, K, provided with the arm, M, clutch, and pins, in combination with the angular draw bars and double harrows. Also, the rod, arms, Q, and rollers, in combination with the angular draw bars and double harrows.

194. Water Wheels; Paul Wagner, Buffalo, New York.

Claim—The combination of the buckets, D, arranged on the cylinder, E, and the stationary inclined planes or buckets, G, arranged with reference to the cylinder, H, and buckets, D, the whole being enclosed by the case, A.

195. Valve Gear for Steam Engines; Elijah Ware, South Boston, Massachusetts.

Claim—Combining the eccentric rod with the valve rock shaft, by means of the lever, with its two arc-formed slots and the movable pins. Also, the combination with the double-slotted lever and its movable pins of the levers, Q V, rods, m U, levers, M N and T, secondary lever, O, pinion, u, toothed arc, S, and rods, L P.

196. Seeding Machines; Moses D. Wells, Morgantown, Virginia.

Claim—The notches of the bar with the series of pins therein, in combination with the guides and upward projecting rims of the discharge openings.

197. Quilting Frame; Joseph Wetherill, Manchester, Connecticut.

Claim—The employment of the rolls, C D E, in combination with the arms, pawls, and notches, so that the upper roll, E, may be lifted when desired.

198. Hoop-fastening for Cotton Bales; George J. Widrig, Memphis, Tennessee.

Claim—The combination of the sides having slots or grooves with the bar, for the purpose of fastening cotton bales, or other similar substances, by bringing the last end over the bar.

199. Constructing Electro-plated Rollers; John W. Wilcox, West Roxbury, Massachusetts.

Claim—Covering the shaft, base, or support with a fillet or ribbon of metal, soldered or otherwise secured thereto, and depositing the copper on said surface by electro-plating.

200. Brick Machines; Russell Wildman, Danbury, Connecticut.

Claim—1st, The vibrating arm, when constructed, combined, and operated as described. 2d, The vibrating feed, when constructed, arranged, and operated in combination with the mould.

201. Gates for Canal Locks; C. W. Williams, Port Jervis, New York.

Claim—1st, The rods and rack applied to the gates. 2d, Having the journals of the gates fitted in oblong slots of the pulleys, which are placed in suitable bearings or boxes, and arranged to admit of the sagging of the gates, and the close fitting of the same when closed. 3d, Securing the bearings or boxes to the lock, by means of the rods, the boxes being attached to slides, and arranged so that the boxes may be adjusted as occasion may require. 4th, Operating the wickets by means of the gearing, whereby either wicket may be operated from one and the same crank shaft.

202. Ploughs; Wm. H. Wilson, Summerfield, Ohio.

Claim—The arrangement of the sub-soil shovel, the common shovel, coulter, and brace, constructed as described.

203. Adding Machine; C. Winter, Piqua, Ohio.

Claim—1st, The arrangement of the lever, spring, shaft, wheels, and stops, in the manner set forth. 2d, The arrangement of the ratchet wheel, bevel wheels, pawls, cord, and pulley, in the manner described.

204. Mode of Applying and Constructing Horse Power Machines; Wm. Zeller, Lebanon Co., Penna.

Claim—The construction by which it is made to drive a reaping machine or stationary power, as described.

205. Hanging Bells; Henry Belfield, Assignor to self and Justice Cox, Philadelphia, Pennsylvania.

Claim—1st, The lever, G, its spring dog, and spring, f, in combination with the bell-crank lever, F, its hammer and spring, n, arranged in respect to each other and to the bell, as set forth. 2d, The bracket, with its four legs and projection for holding the bell, the said bracket being arranged in respect to, and in combination with, the levers, G and F, and their respective springs, in the manner specified.

206. Revolving Plugs for Manufacturing Bottles and Jars; John F. Bodine, Assignor to self, Wm. H., and Joel A. Bodine, Williamstown, New Jersey.

Claim—The large ring bearings, formed on and near the circumference of the turning plate, and fitting in ring grooves formed in the plug and capping plate.

207. Machines for Cleaning Grain; Harrison Fitts, Somerset, Assignor to self and Nelson Turrel, Addison, Michigan.

Claim—The combination of the adjustable piece with the concave and rubber, as set forth.

208. Obtaining Fibres from Waste Felted Fabrics; J. F. Greene, Brooklyn, New York, Assignor to S. B. Tobey, Providence, Rhode Island.

Claim—Subjecting the felts to be disintegrated to the successive and combined action of steam and picking, the steam having the effect either to so unfelt or loosen the hold which the fibres have on each other, in felted fabrics, that they can be drawn apart of sufficient length, to be advantageously employed in the manufacture of other felts or other fabrics.

209. Machinery for Disintegrating Waste Felt Fabrics; J. F. Greene, Brooklyn, New York, Assignor to S. B. Tobey, Providence, Rhode Island.

Claim—The combination of the steaming apparatus and the picker for steaming the felt, as it is passed to the picker to be disintegrated.

210. Machines for Cutting Corn Stalks, &c., on Ground Preparatory to Ploughing; Hezekiah Johnston, Assignor to self and Richard Withers, Collinsville, Illinois.

Claim—Arranging and combining the curved frame with the knives and the guides, in the manner described.

211. Machine for Cutting Files; C. Miller and T. W. Decker, Assignors to T. W. Decker, City of New York.

Claim—1st, Arranging the gauge rest to oscillate on a fulcrum located in relation to the cutting chisel, so that by moving the arm of said rest laterally, by means of the screw, the bed and blank may be adjusted to correspond with the cutting edge of the chisel. 2d, Hinging the frame which carries the chisel and its appurtenances to the frame by a joint at f, so that the rest may readily follow the curve of the file blank, and, with the chisel, be thrown back, when desired.

212. Machines for Wringing Clothes; T. H. Peavey, Montville, Assignor to self and C. G. C. Collins, Portland, Maine.

Claim—The arrangement of the rollers, C and D, with the rollers, A and B, when constructed in the manner described.

213. Threshing Machines; John J. Sigler, Assignor to self and W. M. Griffith & Co., Martin's Ferry, Ohio.

Claim—1st, The series of rollers provided with fingers or projections, in combination with the slab device, b b′ b″, the fingers working in the spaces between the slats, and being used for the purpose of carrying the straw from the threshing cylinder to the place of discharge, and at the same time so tossing it as to secure an effectual separation of the grain therefrom, the slab device being employed for the purpose of supporting the body of the straw between the impulses of the fingers, and also for the purpose of preventing the straw from

winding on the rollers. 2d, The application of the oscillatory motion to the fingered shaft, by means of which I secure an agitation inwardly towards the fan, in addition to the throw towards the place of discharge, for the purpose of more effectually freeing the apertures near the tail of the riddle from obstruction, the required motion being obtained by means of the pinion, rack segment, and arm.

214. Method of Arranging Galvanic-electro Helices for Magnetizing the Driving-wheels of Locomotives; Orrin D. Vosmus, Boston, Assignor to self and Edward W. Serrell, Greenfield, Massachusetts.

Claim—A curved helix applied to the wheels of a locomotive engine, in substantially the manner specified, whereby the point of greatest magnetic effect is the point of contact between the wheels and track. And, in combination with the helix aforesaid, I claim adjusting the helix, in the manner and for the purposes specified.

215. Pumps; Benjamin Douglass, for himself and as Administrator of the estate of Wm. Douglass, deceased, Middletown, Connecticut.

Claim—The combination of the lugs within the flanch, and the conical set nut for fastening the lower end of the pump cylinder.

MECHANICS, PHYSICS, AND CHEMISTRY.

*On the Co-efficients of Elasticity and Rupture in Wrought Iron, in relation to the volume of the metallic mass, its metallurgic treatment, and the axial direction of its constituent crystals.** By R. Mallet, M. Inst. C. E.

[Read before the Institution of Civil Engineers, March 1, 1859.]

It was assumed that amidst the numerous theoretical treatises upon, and practical investigations into, the strength and other properties of iron, the two questions which formed the prominent features of the author's present experimental inquiry had remained comparativley untouched. The conditions of manufacture and the resultant qualities had been hitherto too lightly passed over.

Iron was formerly entirely worked under tilt hammers; the process of rolling was then introduced, and now, in consequence of modern engineering requirements, masses of iron of considerable magnitude were produced by faggoting together, under heavy forge hammers, from large numbers either of bars or slabs grouped together. The masses were not however found to possess ultimate strength in proportion to the number of bars of which they were composed; in fact, it appeared that the strength of the mass became less in some proportion as the bulk became greater. This was admitted as a fact, but no one had hitherto attempted to show experimentally—what function of the magnitude was the strength of a given kind of iron manufactured in a given manner; or how the same forged mass, when very large, differed in strength in different directions with reference to its form; or how the mechanical part of the process of manufacture of the same iron affected its actual strength, either as a rolled bar or forged mass.

Addressing himself to this investigation the author dealt generally with three points of the inquiry, viz.—

1°. What difference did the same large bars of unwrought iron afford to forces of tension and of compression when prepared by rolling, or by hammering under a steam hammer?

2°. How much weaker per unit of section, was the iron of very massive hammer forgings than the original iron bars of which the mass was composed?

3°. What was the average or safe measure of strength per unit of

* From the Lond. Civ. Eng. and Arch. Jour., April, 1859.

section, of the iron composing such very massive forgings as compared with the acknowledged mean strength of good British bar iron?

In the investigation of these questions other subordinate but very important points arose: such as the determination of the relative longitudinal and circumferential strength of equal sections of the iron in massive cylindrical forgings.

The proper measure of the strength of iron, or any imperfectly elastic material, was the "work done," whether by extension, compression, rupture or crushing, due to any force applied to it. The co-efficients T*e* and T*r* were designed by Poncelet to express this work done by an extending or compressing force upon any elastic prismatic body at the point where its elasticity became permanently impaired and its form distorted, and at the further point where rupture occurred. The method of arriving at these co-efficients was then given, and it was shown that, though they were not sufficiently attended to in practice, yet that they were the true measures of the safe and ultimate resistance of materials when applied constructively in machines or otherwise.

The crystalline structure of iron was then considered, and quoting from the author's communication to the Royal Irish Academy (*Trans.* vol. 23, p. 1, 1855), it was shown to be a law that "Iron, whether in the state of cast or of wrought iron, has the principal axes of its integrant crystals arranged in the lines of least pressure within the mass."

If consolidation from fusion took place undisturbed, as in cast iron, the principal axes would be arranged in the directions in which the heatwave had passed outwards from the body in cooling; which would be perpendicular to its surface contour,—those being the direction of least pressure of the internal constraining forces, produced by contraction in cooling, which were necessarily parallel to the planes of external contour.

The effects of rolling and of hammering masses of wrought iron of different contents were then treated of, and it was shown that what was termed "fibre" was the longitudinal extension of the principal axes of the crystals. The original development of these crystals under the constraining forces due to change of temperature, &c., was "cæteris paribus" proportioned to the time given for such development. Thus, in very large forgings the crystals were generally extensively developed, in consequence of the length of time which the mass had been under the operations of heating and forging.

It had long been admitted that large forgings became weaker in proportion as their bulk was increased, but as no definite ratio was recognised it became of importance to fix the conditions of strength in wrought iron under various circumstances. The author was enabled to undertake this investigation, under the authority of the Minister of War, and with the concurrence of the Royal Society, when making the forgings for the two 36-inch wrought iron mortars constructed on his design for the Government; he then selected specimens of iron upon which the experiments of tension and compression were tried.

The methods were then explained by which the specimens of iron were obtained from large masses, and the apparatus was described by

which the observations were made, when the specimens were undergoing the operations of extension and compression. In cutting and boring into the massive cylindrical forgings to obtain the pieces of iron from the various parts, it was invariably found that there existed internally large transverse rents, with jagged and crystalline irregular surfaces, the opposite faces of which were counterparts, and presented distinct evidences of having been torn asunder by contraction from the centre towards the circumference as the mass cooled. The *rationale* of the phenomenon appeared to be, that this action was simply due to the contraction of the external shell before the temperature of the centre had been perceptibly lowered; this in its turn was cooled, and in contracting produced these visible rents or fissures, and no doubt caused other minor dislocations, which detracted from the general strength of the mass.

This was evidently the cause of the difficulty of obtaining very large forgings of a cylindrical form quite sound; as if the diameter was sufficiently great all such cylindrical forgings so built in construction, and so treated by heating, hammering, and cooling in manipulation, must become unsound internally by the opening within the mass of one or more of these rents in the direction of the axis during the process of cooling. In solid cylinders, or conic frustra, it must occur whenever the dimensions were such that the total amount of contraction of the metal in any one diameter from its highest temperature down to that of the atmosphere, as fixed by the circumference of rigidity due to the outer cold shell, exceeded the limit of extension of the iron at rupture due to the length of the diameter of the interior core, which cooled last. This was the theoretic limit of size of forging, beyond which internal rents must occur. The practical illustration was, that almost all cylindrical shafts of wrought iron exceeding 12 inches in diameter were found to have one or more of these rents in them, thus having their strength impaired. This reduction of strength was altogether distinct from any deterioration of quality of the metal, arising from its being alternately heated and cooled and hammered.

The remedy for this play of molecular forces was to construct and work the large forgings hollow. This course had been pursued with success at the Mersey Iron works, Liverpool. When a cylinder had a large concentric cylindrical hole along its axis it cooled at the same time, though not equally, on both the internal and external surfaces, and thus the extremes of internal strains were avoided, and the hollow centre yielded more readily to the forcible compressive grasp of the exterior.

A minute description was then given of all the irons which had been experimented upon, specimens of each being exhibited at the meeting. They were divided into classes according to their several characteristics and modes of working, and into the most analogous class was imported Clay's puddled steel, a comparatively new material, which had been brought into this investigation for the purpose of comparison, and the results were such as promised to be of great practical importance. The general results were the separation of several classes into

two grand divsions: 1°. The crystalline, or sub-crystalline in fracture, which were always the result of manufacture by the hammer. 2°. The fibrous or crystallo-fibrous, which were always produced by the rolling process, but which might be produced by careful and continuous elongation under the hammer.

The very weakest wrought iron of all those experimented upon was found to be that cut transversely from the end of a very heavy cylindrical forging which had been exposed to heat and percussion for nearly six weeks. Exposed to tension its elastic resistance was only $3\frac{1}{4}$ tons per square inch, which was less than the average of cast iron; thus, as regarded pressure, it was the very weakest iron produced by any method of manufacture; whilst the faggot bars of which the mass was built and welded up, bore a tension of upwards of 12 tons per square inch before losing their elasticity, and of nearly 23 tons at rupture, and a pressure of nearly $21\frac{1}{2}$ tons before losing elasticity, and of nearly $27\frac{3}{4}$ tons at the point of total distension or crushing: thus proving the fact that the extreme weakness of wrought iron in heavy forging was not due to any metallurgical alteration in the constitution of the metal, but to changes in its state of aggregation, induced by a process of forging, by the long-continued and unequal heating, and by the hammering.

Hence was deduced the conclusion, that practically the iron of very heavy shafts, forged guns, huge cranks, and other similar masses, might be expected to become permanently set and crippled at a trifle above 7 tons per square inch, and to give way by fracture at about 15 tons per square inch by tension, and to completely lose form at pressures of from 15 to 18 tons per square inch. Therefore it followed, that allowing a deduction of one-half, as sanctioned by practice, from the elastic limits of tension and of pressure for the margin of safety, the iron of such forged masses should not be trusted for impulsive strains exceeding about $1\frac{3}{4}$ ton per square inch of tension, and about $4\frac{1}{2}$ tons per square inch of pressure, or for passive tensile-strains of $3\frac{1}{2}$ tons per square inch, or for passive pressure beyond 9 tons per square inch.

Further experiments demonstrated that in heavy rectangular forged slabs of upwards of 12 inches in thickness, in the plane of the slab, the resistance to all the forces was much higher, and hence large cranks which were usually cut out of such rectangular forgings were stronger than the shafts to which they were attached, in the ratio of 8 to 6. The physical cause of the difference in strength between large cylindrical and rectangular forgings, although made from the same original material, was to be found in the difference of the molecular arrangement. The integral crystals of the cylindrical masses were strained, distorted, and partially separated by the effects of hammering in various directions, and by the peculiar constraining forces due to the contraction in cooling; whereas, none of these forces acted to the same extent upon rectangular masses, which were only hammered in three directions, and the constraining forces of cooling were all parallel to the faces of the parallelopiped, or in three directions only.

A special peculiarity noticed in heavy forgings was the sudden and extreme inequalities of texture and of strength found in different and even in closely adjacent portions of the same mass, producing greater uncertainty of result in practice.

Another peculiar feature was that the rates of extension or of compression did not move uniformly, but by fits and starts. This phenomenon obviously arose from the *per saltum* disintegration of planes of crystallization, and their more or less complete separation in a crystallized but yet ductile body. This had never been observed in fibrous irons, or in those in which the finely elongated crystals were all rolled parallel and in the line of the length of the bar or the sheet.

If the original or integrant faggot bars, from which a heavy forging was built and welded up, had a tensile elastic strength of 12 tons per square inch, the forged mass itself would have a mean tensile elastic strength of only 7 tons per square inch; and correspondingly if the faggot bar had a compressive elastic resistance of $2\frac{1}{2}$ tons, the forged mass itself would range under 18 tons per square inch.

Thus, within the limits of practice, the work of passive resistance sustainable by heavy forgings was about one-half that of the faggot iron from which they were manufactured; but at the ultimate point of rupture they gave a better result. Heavy forgings were also more trustworthy when exposed to tensile strains in direction of their length or to transverse strains, as in girders, which ultimately were resolved into longitudinal strains, than when subjected to twisting strains, as in shafts, or to direct pull across the direction of length.

These and other considerations induced attention to the apparently superior power of puddled steel to support the forces by which the ordinary forged masses of wrought iron were fractured, especially as by the employment of smaller and lighter masses greater strength in shafts, &c., could be secured. One special peculiarity appeared to be, that in the heaviest pieces of this material the internal structure was as fine and close in the grain as it was in the smallest bar. The elastic limit was above that of the best wrought iron, and the elasticity was so much more perfect, that it might be trusted almost up to the elastic limit of about 15 tons per square inch, and in forged masses it possessed this strength nearly equally in every direction. The range of extension at the elastic limit was rather greater than that of fibrous hammered bar iron of excellent quality. Beyond the elastic limit, with equal increments of strain, its extension did not rapidly diverge and increase, as in wrought iron; it slowly increased up to about 20 tons per square inch, and gradually and evenly enlarged up to the breaking point, which was not reached within 42 tons per square inch, and was often found to reach 48 tons per square inch.

This puddled steel was not like cast steel, a harsh, rigid, and glassy material, which possessed indeed enormous cohesion, but yet was so rigid and unaccommodating to forces variable in direction and impulsive in character as to deprive it of trustworthiness in practice. On the contrary, puddled steel appeared to combine the great strength of cast steel with ductility and perfect elasticity of the best wrought iron.

Its resistance to pressure was very remarkable, being more than double that of harsh crystalline wrought iron, and more than three times that of the best fibrous wrought iron in bars or plates. Thus it may be safely used under a passive strain or load of 20 tons per square inch, after allowing a margin of one-half for security.

Puddled steel would thus evidently become an important practical adjunct in the construction of machinery, in building vessels of light draft of water, and for artillery of the largest calibre. It possessed also the peculiarity of resisting corrosion much better than wrought iron plates, and thus had an additional value for ship-building.

An investigation was then entered into of the causes of the manifestly greater strength of the integrant slabs than of the large forgings built up from them; but it was shown that this quality did not extend to the boiler plates which acquired a certain amount of rigidity. This was also possessed by the puddled steel, and it was anticipated that it would ultimately be extensively employed for the boilers, and even the fire-boxes of the locomotive boiler.

From this investigation nothing of a certain character could be concluded as to any fixed relation between the strength and the specific gravity of the several sorts of iron experimented upon. The weakest irons—those from the heavy forgings—having generally the highest specific gravities, though always lower than their integrant faggot bars. Thus it appeared that specific gravity was a characteristic to which too great importance had hitherto been attached in relation to strength both in cast and in wrought iron. It was modified, increased, or diminished by the mechanical operations of manufacture to an extent far beyond anything that chemical difference of constitution produced, and in reality it afforded no criterion of strength, although in fibrous irons it did afford an index of their degree of extensibility for equal size.

The modulus of elasticity deducible from these experiments, from the mean results of the great forgings, was 12,559,680 lbs., or 3,771,675 feet for iron forged in great cylindrical masses. The mean specific gravity being taken at 7663, the weight of 1 foot long by 1 inch square of this iron was 3·33 lbs. The modulus for great forged rectangular masses or slabs was 18,079,200 lbs., or 5,478,545 feet; the specific gravity bĕing 7610, and the weight of a bar 1 foot long and 1 inch square 3·30 lbs. Both fell far below the modulus for good English bar iron of 7,550,000 feet as deduced by Tredgold, or even below 6,787,878 feet as deduced by Edwin Clark from Eaton Hodgkinson's experiments.

The author concluded his paper by recording the obligations he was under to Messrs. Horsfall and to Mr. Clay, of the Mersey Steel Works, Liverpool, and to the officers of the War Department and Royal Arsenal Woolwich, for the facilities afforded to him during his investigation.

*New Paper Materials.** By M. C. Cooke.

One result may fairly be attributed to the offer of a premium, by one of the daily papers, for a new and available paper-stuff, which should supply the deficiency of rags; and that result an important one. It has stimulated many an effort to supply that want not only at home but abroad; and we are now in a much better position to do without rags for our own paper manufacture than at any other period of our history. It may be true that the premium has never been paid, but it is equally true that we are nationally full the thousand pounds richer on account of that offer. Why it has not been paid, forms no part of this inquiry, neither to whom it should have been awarded. Let it suffice to point to some of its results. Out of the numerous efforts to furnish good paper with only a per centage of rags, one of the most successful with which I am acquainted is that of Dr. Collyer, which was patented in 1857. It consists in applying the residue of the beet-root left in the process of sugar-making and distillation to the manufacture of paper, papier mache, millboard, and other paper manufactures. One feature pointed out in the process of this manufacture is, that no sizing is necessary, on account of the nature of the material used. In consequence of the whole mass being permeated, instead of the surface alone being covered, it is, from its compactness, solidity, and elasticity, not liable to crack, and for the same reason will resist damp and moisture when in the form of paper. The patentee states, "The extraordinary tendency which the cellulose, starchy, and proteine substances have to enlarge when exposed to heat and moisture, renders them very valuable for giving strength to other material, especially to cotton, which is deficient in these properties. When thus mixed each fibre of the cotton becomes cylindrical and thick, and attains the strength of hemp and flax, and no longer loses its shape through pressure. A similar improvement is evident when it is combined with other materials. A proportion of 10 per cent. of the prepared residue with the other usual material, makes tougher and more flexible paper. Twenty-five per cent. renders packing paper sufficiently waterproof that it will require no other sizing. Fifty per cent. will produce paper nearly or quite as strong as parchment, and which in very thin sheets will preserve articles packed in it from dampness. Strong paper, cardboard, &c., can be made from 75 per cent. of prepared residue and 25 per cent. of cotton; also of 50 per cent. of prepared residue, 40 per cent. of raw residue, and 10 per cent. of saw-dust, hay, straw, &c. Fifty per cent. of prepared residue and 50 per cent. of fine cut straw will produce strong packing paper, as will also 50 per cent. of white saw-dust, 30 per cent. of prepared residue, and 20 per cent. of cotton rags. A good, strong, white paper for printing purposes has been made with 50 per cent. of beetroot residue and 50 per cent. of cotton, no sizing being required in the process, and the result has been entirely satisfactory, the paper so made being remarkable for its tenacity. It will, however, have

* From the Lond. Jour. of the Society of Arts, No 321.

been observed that something beside the beet-root residue is required to make good paper, and that the best substance for that addition is cotton or cotton rags, the use of which this patent does not supersede."

Another patent, or rather series of patented paper pulps, worthy of notice, are those of Mr. Plunkett, of Dublin,* in all of which the material, *per se*, is capable of furnishing serviceable paper. Patented also in 1857, the entire value and capabilities of the materials have not yet been fully ascertained. Mr. Plunkett's papers are made from four different plants, any one of which furnishes a good paper pulp, and may be obtained in almost unlimited quantities. These are the tree-mallow, red clover, hop bine, and yellow water-iris. To the first of these we may look, perhaps, for the most satisfactory results. The order to which the tree-mallow belongs is composed of eminently fibre-producing plants. Independent of the cottons, we have numerous species of *Hibiscus*, *Sida*, *Abutilon*, *Urena*, and *Thespesia*, yielding useful fibres which leads us to expect, perhaps to find in *Lavatera arborea* a good material for pulp.

"The tree-mallow grows wild on several parts of the south-west coast of Britain, as well as on the east coast of Scotland, on rocky cliffs, flowering in July, and often producing a long succession of bloom. In gardens the plant often remains some years without blossoming, but dies in the winter after it has flowered, being naturally biennial. Seeds scattered in the ground will, some of them, keep springing up every season for an undetermined number of years, but the young plants are impatient of the cold, except in maritime situations, and few of them survive even a single winter. The root is deep and much branched; stem, 6 to 10 feet high, upright, straight, round, simple, except in the upper part, where it forms a branched leafy head. It is clothed with clusters of small deflexed bristles. Leaves alternate on long stalks, pliable and downy, of seven shallow crenate lobes. Flower on simple axillary clustered stalks, very much like those of *Malva sylvestris.* Outer calyx deeply divided into three large lobes, but not as in Malva formed of three separate leaves. A slight or rather artificial distinction."†

On inquiry, I find that the *Lavatera* will, with the addition of saline manure, grow freely on the deepest bog land. My informant states that he has seen it in perfection on the west coast of Donegal, growing where there was very deep bog, at least thirty feet. A gentleman in Londonderry, who is owner of a large tract of slob land, intends cultivating the plant extensively next season, for which purpose he has about 250 acres at disposal. When this experiment shall have been made, we shall be in possession of facts as to the cost of culture and the produce per acre. The plant, if cultivated, would not only yield hemp enough for home use, but also give, from the hacklings, or tow, and the wood, a large supply of paper material. The quality of the hemp obtained from the bark would command for it a ready sale.

* Specimens of these substances were shown at the Society's last Annual Exhibition of Inventions. See Catalogue for 1858, No. 301.—Ed. J. S. A.

† English Botany, or Colored Figures of British Plants. London, 1803.

Cordage has been made from it experimentally, and so satisfied were the company entrusted with the manufacture of the specimens, that they have guaranteed the purchase of any quantity which may be grown on the Londonderry estate next season. The refuse leaves, wood, and tow, would furnish paper pulp.

The process of manufacture of paper from these substances is that ordinarily pursued. The wood has to be reduced to chips or shavings, and whether wood, leaves, or tow, boiled in caustic alkali and bleached in the ordinary manner. The paper thus made presents no external variation from that made of rags.

Specimens of the plant, wood, hemp, cordage, fine thread, and lace, made from this plant, together with paper made from the wood, I shall be happy to show to any one interested in the experiment.

Another substance used by Mr. Plunkett for paper pulp is the common red clover, *Trifolium pratense*, in order to obtain which, the clover is taken, either in its green state or when dried into hay, and first submitted to a rippling process, by means of which the leaves and blossoms or seeds are saved as fodder for cattle. The stalks are then submitted to the action of caustic alkali, bleached and pulped in the usual manner. Paper and cardboard produced from this pulp is also of a firm and excellent quality.

A third material is subjected by the same gentleman to a similar process with a like result. This substance is the hop bine, or twining stems of the *Humulus lupulus*, a material which, in many parts of the country, may be obtained in almost any quantity, and which has been hitherto regarded rather as a nuisance than as a stock to be converted into a valuable article of trade. Instead of being as heretofore, burnt up for manure, Mr. Plunkett has shown that it may be converted into a useful paper, the dried bine yielding from 70 to 75 per cent. of fibrous matter.

The fourth and last of Mr. Plunkett's papers is made from the yellow water-iris (*Iris pseudacorus*), which is not only a very common weed in Ireland, but is also common enough in the marshy parts of England. It yields when dry, about 60 per cent. of available fibre or half stuff, and, as far as one can judge from unsized specimens made by hand, will make a paper equal to that produced from either of the other sources.

Hence it will be seen, that the Irish patents, in each instance, offer a material, not to be used in conjunction with rags or other fibre, but independently, as substitutes for those substances. In each case the raw material is either common enough, or, as in the instance of the Lavatera, may be easily cultivated on waste lands in sufficient quantities to supply all our wants; and beyond this to furnish us with a fibre for cordage and textile manufactures of a new but valuable kind at home, instead of seeking supplies from Russia and India.*

Independently of "substitutes for paper material" at home, and

* The last patented paper material is that of Mr. Haughton, for converting the refuse of flax straw into pulp. The process consists of an application of an alkali, in a heat of nearly 400 deg. Three tons of flax refuse, at from 20s. to 50s. per ton, can, it appears, be converted into one ton of pulp. The rags for the same amount of pulp would weigh one ton and a third, and the lowest price of rags is £15 per ton.

of the premium before alluded to, the reports of the Paris Universal Exhibition contain an interesting account of a paper material now in course of manufacture by a company established at Florence from the common asphodel (*Asphodelus ramosus*). The roots are first made to undergo a process of distillation, during which alcohol is obtained, and the residuum, together with the other parts of the plant, is converted into card paper, cards and paper, including writing papers of various qualities. The gum which abounds in asphodel, is a highly advantageous ingredient; it gives gloss to cardboard, and prevents writing paper from becoming absorbent. The stoutest cartridge paper which is made from this plant is found to bend without breaking, and is not apt to tear. Corsica, Spain, Algeria, Portugal, all have hastened to follow the example of Tuscany, and to seek to derive advantage from asphodel, either as yielding alcohol or paper-stuff, or both. If even the enormous tracts which are covered with asphodel should in time be exhausted, the culture of the plant is by no means difficult. The manager of the Grand Duke's domain, at Alberese, offered, a few years ago, 40,000 francs for the extirpation of the asphodel, in a comparatively limited territory, and no person was found to undertake the next to impossible task. It is stated, moreover, that the asphodel produces alcohol and paper, at a much cheaper rate than any other material which has yet been tested, and there is good reason to hope that it may yet prove a providential benefit to many sterile and unproductive districts.

From North America, I have just received a series of specimens of what our brethren are doing on the other side of the Atlantic in paper stuffs. This series contains white pulps, made from white pine, yellow pine, white cedar, red cedar, hemlock, spruce, white oak, maple, gum, chestnut, ash, bass, sycamore, birch, catalpa, beech, willow, paper mulberry, mulberry bark, black walnut, elm, tulip poplar, hickory, straw, reed, maize, and sun-flower. The American straw papers seem to possess tenacity and quality superior to those of British manufacture. To what extent these wood papers are made and used in America, I have as yet received no information, the promised papers and particulars not having come to hand.

These remarks on new materials for paper, are essentially fragmentary; there are many other substitutes, and some not generally known to the public, which have been patented and experimented upon within the past two or three years; but to enter into any particulars concerning them, would extend this paper far beyond the limits I have assigned to it.

It would not be an uninteresting or impossible inquiry to ascertain the history and progress of this question of rag substitutes for paper during the past seven years—a subject to which I may return at some future opportunity.

Trinity School House, Lambeth.

*The First Galvano-Electric Telegraph.**

It was the Russian Baron Schilling who, at Munich, so long ago as 1816, had invited the Honorable Frederick James Lamb, then British Envoy and Minister Plenipotentiary to the Court of Bavaria, to accompany him to Dr. Samuel Soemmerring, in order that he might see his telegraph, the first ever made to act by a galvanic battery. Schilling having introduced the British Minister to Soemmerring on the 2nd of July of the year mentioned (1816), repeated the visit with him ten days later, the 12th of July, when the telegraph was made to operate before them. Besides the brother of Lady Palmerston and the Russian Baron Schilling, there were on that occasion present also, the Countess Banfy, Schilling's sister and her husband Count Banfy, from Vienna, then on a visit at Munich. Dr. Hamel proves that the date of Soemmerring's invention is nowhere accurately stated. His first telegraphic apparatus was made between the 9th July and 6th August, 1809. Baron Schilling, who was at that time attached to the Russian mission at Munich, saw it for the first time on the 13th August, 1810, and from that day he became an enthusiastic laborer in the field of electric telegraphy. In the autumn of 1812, he was enabled, by means of a subaqueous conductor, planned by him in April and May, at Munich, to explode powder mines across the river Neva near St. Petersburg. Subsequently he made the very first electro-magnetic telegraph, a copy of which, in 1836, found its way through Bonn and Heidelberg to London. In 1837 there was at St. Petersburg a submarine cable making for him, with which he intended to unite Cronstadt with the capital, through the Finnish Gulf. His death, which took place on the 7th August, prevented the execution of this early submarine telegraph enterprise.

On a Peculiar Case in which Baryta is not Precipitated by Sulphuric Acid.† By T. Scheerer.

The author observed, that in the salt of phosphorus employed in blowpipe experiments, which often contains sulphuric acid, the latter cannot be detected by the salts of baryta when the salt has been fused. From this he concluded that metaphosphoric acid prevents the precipitation of sulphuric acid in the form of sulphate of baryta, and further experiments have confirmed this view.

If a large quantity of dilute muriatic acid be added to a solution of metaphosphate of soda, and then solution of chloride of barium, dropped in and mixed by stirring in order that the precipitate of metaphosphate of baryta formed at first may dissolve again in a sufficient excess of muriatic acid and water, the addition of very dilute sulphuric acid to the perfectly clear solution produces no precipitate of sulphate of baryta. After standing for several hours and sometimes

* From the Lond. Jour. of the Society of Arts, No. 328.
† From the Lond. Chemical Gazette, No. 391.

even for days, the fluid begins to grow turbid; but if it be boiled, this operation causes the formation of more or less of a white precipitate.

Repeated experiments showed the author, that the production of these phenomena depends on the degree of dilution of the sulphuric acid, and also that neither the ordinary tribasic phosphoric acid, nor pyrophosphoric acid, has any influence upon the appearance or non-appearance of the sulphate of baryta.

For the Journal of the Franklin Institute.

Description of J. E. Wootten's Improved Water Gauge.

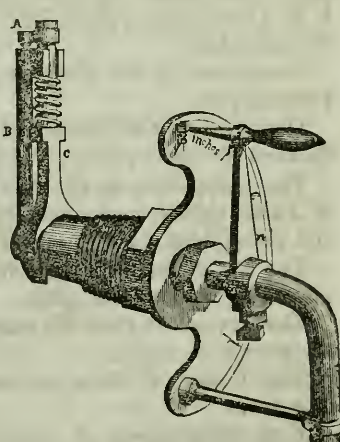
The instrument represented in perspective by the accompanying illustration, is designed for ascertaining the exact level of water in steam boilers.

Its nature consists in being provided with a right-angled tube of about half an inch diameter, with a bore of three-sixteenths of an inch. The arm, B, of this tube, when at rest, stands perpendicularly within the boiler, and should be of such length that when its position is reversed it is capable of reaching the lowest level of water which the boiler may contain with safety.

The other arm passes through a stuffing-box within which it should be free to have a semi-rotative movement upon its axis—and a lever is attached to its outer end for the purpose of imparting to it the necessary motion.

A thread cut upon the body of the instrument serves to make the necessary connexion with the boiler.

The aperture at the upper end of arm B, is covered by a conical valve, A, which is actuated by means of the lower end of valve rod, C, passing over a cam when the instrument is brought into operation. The lift given to the valve is rather less than an eighth of an inch, being quickly raised and held uniformly open during trial. A spiral spring is employed for the purpose of keeping the valve seated when not in use.



A dial is attached to the instrument, which, being graduated in inches, indicates by means of a pointer the height of water (above the lowest admissible level,) which is contained within the boiler at the time of trial.

When it may be desired to ascertain the water level, the handle should be moved in the direction of the figures; the valve, A, is at once lifted from its seat and a passage opened through the tube. When the end of arm B, in its descent has reached the surface of the water, its level is indicated by the position of the pointer in reference to the figures upon the dial face.

Upon restoring the handle to its original position, the valve rod reaches the depression of the cam and the valve is allowed to close.

The advantages of this instrument over the gauge cocks commonly in use, are, its adaptation to denote the *exact* height of water—its freedom from leakage and consequent cleanliness, as well as its non-liability to the choking and stoppage incident to the ordinary form of gauge cock.

The comparatively small space occupied by the instrument is also worthy of consideration. The funnel for receiving the discharged water need not exceed one-and-a-half inches diameter, and the entire arrangement will occupy considerably less room than is required by a set of gauge cocks, with their customary appendages.

FRANKLIN INSTITUTE.

Proceedings of the Stated Monthly Meeting, May 19, 1859.

John C. Cresson, President, in the chair.

John Agnew, Vice-President,
John F. Frazer, Treasurer,
Isaac B. Garrigues, Recording Sec., } Present.

The minutes of the last meeting were read and approved.

Donations to the Library were received from the Royal Institution, The Institute of Actuaries, and Edward Smith, M. D., London; the Austrian Engineers' Association, Vienna, Austria; Prof. A. Dallas Bache, Coast Survey, Washington, D. C.; the Water Commissioners of the City of Detroit, Michigan; the Mechanics' Institute, San Francisco, California; Edward Miller, Esq., C. E., St. Louis, Missouri; J. P. Lesley, Esq., A. J. Brasier, Esq., and Professor John F. Frazer, Philadelphia.

Donations to the Cabinet of Models from Prof. John C. Cresson, Philadelphia.

Donations to the Cabinet of Minerals and Geological specimens from Edward T. Hyatt, Esq., Philadelphia.

The Committee on the Library reported that Henry Seybert, Esq., of Philadelphia, had deposited in the Library, 180 volumes of books and pamphlets, for the use of the members.

The Periodicals received in exchange for the Journal of the Institute, were laid on the table.

The Treasurer read his statement of the receipts and payments for the month of April.

The Board of Managers and Standing Committees reported their minutes.

Five resignations of memberships in the Institute were read and accepted.

Candidates for membership in the Institute (6) were proposed, and the candidates (5) proposed at the last meeting were duly elected.

Mr. Wm. Golding exhibited an eccentric wheel and strap, in which the friction usual to such pieces of machinery is got rid of by means

of friction rollers attached to the strap and bearing upon the face of the wheel.

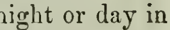
A model of a bridge for short spans, in use upon the Mine Hill and Schuylkill Haven Railroad, was upon the exhibition table for the inspection of the members. It is simple in design, and not expensive. The righting of the bridge is done by means of struts, which abut at the middle of the span, and have their lower ends resting upon plates inclined towards each other, and set against the abutments. These ends stand some distance apart, and are kept from sliding down the inclined plates by a bolt passing through both. By screwing up the nut of this bolt, the struts approach each other and move up the inclined plates, when the abutted ends rise, and with them the cross timber of the bridge. Also, a working model of a switch lever used upon the same road, in which the catch is moved by a supplementary lever operated by the act of grasping the main lever, in the mode adopted for the starting bar of marine and locomotive engines.

A. C. Jones explained his self-acting coupling for fire engine and other kinds of hose, steam, gas, or water pipes, which require to be frequently connected and disconnected.

It is self-fastening and self-tightening in principle. The hose coupling shown to the meeting consists of a brass male and female secured to the ends of the hose in the usual manner; the female is of a conical or flaring form to receive the end of the male, which has a pipe or ring of vulcanized rubber projecting three-eighths of an inch from its interior. This short pipe passes into the female, and the pressure of the water or steam against its inner surface forces it in contact with the surrounding metal, and makes the joint, and its tightness increases with the pressure; all other couplings are the reverse of this, for as the pressure increases the tendency to leak becomes greater.

The coupling may be connected or disconnected by night or day in a second of time without any tools being required, and when constructed, twisting, shaking, or throwing about will not open it; and the more pulling strain is put on it the firmer it becomes locked.

The locking or coupling is effected by a peculiar shaped clamp or pawl resting on a bed between jaws formed on the two sides of the female; this clamp has a shoulder at one end and a broad hook at the other; the shoulder rests against a bearing on the female, and the hooked end drops into an appropriate formed groove extending around the extension of the male.

All the pulling force is applied in a straight line, thus, 
The clamp is kept in place by a pin passing through the sides or jaws, and a small slot in the substance of the clamp; in this narrow hole a small piece of rubber is placed; when the hooked end is raised the rubber is compressed against the pin, and when the pawl is released the elasticity of the rubber restores it to its flat bed.

To couple, the two parts are pressed against each other, the clamps open admitting the male, and the hooked ends drop into the groove, and are kept there when the hose or pipe is without pressure, by the elasticity of the rubber before mentioned; kicking and various other forcible means have been tried to open it, without succeeding. To un-

couple, only one clamp need be raised; this can be effected by the thumb and finger raising the end out of the groove, or a knife, nail, &c., may be used as a lever.

The advantages which the inventor claims over *all* other hose couplings are: that it is *shorter, lighter, more quickly coupled or uncoupled* by one man, in the *dark* or by daylight; a more *perfect swiveling;* will bear *more* "wear and tear;" sustain *more change of form* without preventing its use; less first cost, and no loose parts to get lost, and that no injury short of total destruction will prevent the use of the section of hose at a fire.

COMMITTEE ON SCIENCE AND THE ARTS.

Report on Mr. S. W. Hall's Thermograph.

The Committee on Science and the Arts constituted by the Franklin Institute of the State of Pennsylvania, for the promotion of the Mechanic Arts, to whom was referred for examination "a Thermograph," invented by Mr. S. W. Hall, of Philadelphia, Pennsylvania,

Report:—That the apparatus of Mr. Hall is formed of a spiral glass tube, terminated outwardly in a branch which is prolonged with a smaller curvature; this tube is delicately balanced upon a horizontal axis. The spiral portion of the tube contains alcohol (or any other liquid or gas), while the prolonged branch contains a plug of mercury, which is in contact at its inner surface with the alcohol, while on its other side it has a partial vacuum formed in the outer end of the tube. Of course, as the alcohol expands or contracts, the mercury is moved farther from, or nearer to, the axis, and the change in the position of the centre of gravity of the system causes a rotation around the axis, and this motion is transferred by levers to a needle point, which is lifted or depressed, according as the alcohol is expanded or contracted. In front of the needle a band of paper is made to pass with an uniform motion, communicated to it by rollers which at the same time print upon it a series of horizontal and vertical lines, the former of which correspond to certain temperatures, and the latter record the hours. And, by a modification of its striking works, the same clock work which governs the motion of these rollers, causes a vertical bar to press, at the end of every five minutes, the needle point through the paper, from which it is immediately withdrawn by a spring, thus impressing a permanent and easily visible mark recording the temperature of the instrument at that instant of time.

So far, the apparatus has been constructed, and in action for some time in the Hall of the Institute, as well as elsewhere; and it will be seen by the record submitted to the Committee that its operation is entirely satisfactory, tracing a curve of temperatures by observations so close together that no appreciable error can be committed in determining from it either the maximum and minimum, or the mean temperature of the day.

As to the originality of this instrument, the Committee have no

recollection of having ever seen or read of the application of the expansive force of a gas or liquid to produce a permanent record of temperatures, by the displacement of a mass of heavy matter relative to an axis of motion: they have, therefore, no cause to doubt the originality of its invention.

As to its utility, it appears to the Committee to possess the following advantages:—

1st. The power developed by the instrument is considerable. The mechanical force exerted by the displacement of a mass of mercury with a considerable leverage from the centre of motion, is so great as to ensure the satisfactory operation of the instrument, and to allow of considerable resistance at its working parts without deranging its action.

2d. This instrument is invariable; being once graduated and set, very ordinary care is sufficient to prevent any derangement of its mechanism; its record will, therefore, probably remain the same, without derangement of its zero or change in the length of its degree.

3d. It is, considering its utility, not too expensive. The inventor estimates that a perfect instrument may be made for $20 to $50. This includes, of course, no estimate for ornamentation. For a meteorological observatory, or for the ordinary recording of atmospheric temperatures at home, this is not an extravagant expense. And it does not appear that any more repairs ought to be required for an apparatus of this kind than for the common clock, which forms its basis.

It is, however, only for recording atmospheric temperatures, and for observatories or houses that the apparatus is fitted. It occupies considerable space, and from its structure could not be conveniently carried in traveling, except by sea. As, however, the scale and the motion of the paper may be varied at pleasure within extensive limits, it appears possible to arrange the apparatus either for very delicate registering during a comparatively short time, or for a long continued course. If the clock could be kept in motion, as is now quite possible, there is no reason why the apparatus might not be left to itself, to record the temperatures during a whole year, during which time it would require neither superintendence nor adjustment.

Mr. Hall, moreover, proposes modifications in the form of the instrument, by means of which it may be made to record within an apartment the temperature of the air outside, indicating the actual temperature at every instant, while it records them as usual every five minutes.

He also has devised an ingenious self-recording barometer, on the same general principle of obtaining the record. These instruments, however, will more properly form the subject of separate reports, when they shall have been so far perfected as to be submitted to the inspection of the Committee.

At present, the Committee confines itself to the expression of the opinion that the instrument constructed and exhibited by Mr. Hall is new, ingenious, and useful, and worthy the attention of all who take an interest in meteorological records.

By order of the Committee,

Philadelphia, March 10, 1859. WM. HAMILTON, *Actuary.*

Abstract of Meteorological Observations for March, 1859*; made in Philadelphia, Somerset, and Dauphin Counties, Pennsylvania, for the Committee on Meteorology of the Franklin Institute.*

Philadelphia.—Lat. 39° 57′ 28″ N. Long. 75° 10′ 28″ W. Height above the sea 50 feet. Prof. J. A. Kirkpatrick, Observer.

1859. March	Barometer. Mean.	Barometer. Mean daily range.	Thermometer. Mean.	Thermometer. Daily oscillation.	Thermometer. Mean daily range.	Relative humidity. 2 P. M.	Force of vapor. 2 P. M.	Rain and Snow.	Prevail'g winds.
	Inch.	Inch.	°	°	°	Per ct.	Inch.	Inches.	Direc.
1	30·073	·270	34·3	12	8·3	34	·091		N W.
2	30·342	·269	29·3	18	5·0	46	·097		NNW.
3	29·960	·382	32·8	13	5·5	89	·168	1·723	E S E.
● 4	29·438	·522	46·7	20	13·8	39	·167	0·010	S W.
5	29·603	·145	44·0	10	5·0	42	·142		WNW
6	29·987	·384	46·3	18	4·7	43	·180		W.
7	29·832	·210	44·0	16	2·3	65	·245	0·757	E.
8	29·378	·454	45·7	8	6·0	85	·285	0·127	N E.
9	29·815	·437	46·3	17	5·3	32	·133		N W.
10	30·033	·218	43·7	21	2·7	37	·156		S W.
☽ 11	29·953	·080	50·7	20	7·0	64	·308		S S E.
12	29·806	·154	58·5	14	7·8	59	·375	0·546	S W.
13	30·050	·244	56·3	23	3·5	26	·175		S W.
14	29·984	·099	52·7	21	3·7	33	·188	} 1·300	(var.)
15	29·556	·428	55·7	14	7·7	71	·367		S W.
16	29·983	·427	48·7	16	7·0	40	·179		W.
17	30·034	·113	51·0	23	3·0	36	·201		S W.
○ 18	29·431	·604	58·7	17	7·7	89	·549	0·462	S E.
19	29·335	·220	42·3	5	16·3	51	·142		S W.
20	29·755	·420	45·3	18	7·0	30	·122		W.
21	29·927	·171	45·3	20	1·3	36	·146		WSW.
22	29·723	·204	54·8	28	9·5	56	·397	0·375	(var.)
23	29·761	·098	55·2	19	4·3	28	·162		N W.
24	29·681	·114	50·0	11	4·8	74	·308	0·472	S E.
25	29·514	·167	52·3	15	2·3	76	·380	0·211	(var.)
☾ 26	29·605	·091	42·0	13	10·3	37	·129		N W.
27	29·656	·051	49·2	22	8·5	53	·236		S W.
28	29·608	·048	57·0	27	4·5	48	·353		S E.
29	29·339	·269	53·7	11	6·7	87	·407	0·520	(var.)
30	29·545	·209	51·0	13	2·7	30	·141		W.
31	29·796	·248	48·2	20	4·2	23	·114		(var.)
Means	29·758	·250	48·1	17	6·0	50	·227	6·503	8.67°w

Somerset, Somerset Co. Lat. 40° N., Lon. 79° 3′ W. Height 2195 feet. Geo. Mowry, Observer.

1859. March	Barometer. Mean.	Barometer. Mean daily range.	Ther. Mean.	Ther. Mean daily range.	Relative humidity. 2 P. M.	Force of vapor. 2 P. M.	Rain and melt'd Snow.	Prevail'g winds
	Inch.	Inch.	°	°	Per ct.	Inch.	Inch.	Direc.
1	27·818	·187	27·7	4·6	54	·107		N W.
2	27·927	·113	25·7	2·0	59	·121		S E.
3	27·422	·505	31·3	6·3	89	·175	0·518	S E.
● 4	27·136	·286	39·3	8·0	61	·182	0·165	W.
5	27·419	·284	35·0	4·3	82	·212		W.
6	27·690	·271	38·3	9·3	53	·207		S E.
7	27·418	·272	38·3	10·7	86	·192		S E.
8	27·192	·289	40·0	3·7	100	·257	0·623	W.
9	27·616	·424	38·0	6·3	72	·221		W.
10	27·662	·049	42·7	6·0	70	·288		S E.
☽ 11	27·528	·134	50·3	8·7	71	·367	0·275	S S E.
12	27·573	·138	47·0	5·0	60	·262		(var.)
13	27·784	·208	46·7	9·0	61	·340		?
14	27·525	·259	49·3	12·0	92	311	0·257	(var.)
15	27·367	·265	39·7	9·7	71	·201		W.
16	27·769	·403	37·7	5·3	63	·159		(var.)
17	27·644	·152	49·3	11·7	49	·315	} 1·032	S W.
○ 18	26·967	·677	52·7	9·3	87	·362		S.
19	27·163	·339	27·3	22·0	100	·153		W.
20	27·645	·482	32·7	6·0	64	·152		W.
21	27·633	·031	48·0	15·3	60	·324		S.
22	27·480	·153	49·3	10·0	90	·328		WSW.
23	27·602	·122	46·0	8·7	54	·268		(var.)
24	27·347	·255	54·0	8·0	77	·429	0·164	(var.)
25	27·300	·066	40·0	14·0	65	·168		W.
☾ 26	27·412	·112	31·3	8·7	54	·123	0·071	W.
27	27·318	·094	53·7	22·3	67	·385		(var.)
28	27·265	·069	55·7	2·7	56	·352		S S E.
29	27·081	·191	48·3	8·0	67	·269	0·173	W.
30	27·353	·267	39·3	0·0	53	·182		W.
31	27·633	·279	39·0	3·7	53	·159		W.
Means	27·474	·238	41·6	8·7	69	·244	3·278	

Harrisburg, Dauphin Co. Lat. 40° 16′, N. Long. 76° 15′, W. John Heisely, M D., Observer.

1859. March	Barometer. Mean.	Barometer. Mean daily range.	Ther. Mean.	Ther. Mean daily range.	Rain and Snow.	Prevail'g winds
	Inch.	Inch.	°	°	Inch.	Direc.
1	30·016	304	36·0	5·7		N W.
2	30·264	·248	30·3	5·7		N W.
3	29·787	·476	33·3	4·3	} 1·038	S E.
● 4	29·241	·546	42·0	8·7		W.
5	29·543	·302	41·7	1·7		N W.
6	29·893	·350	43·3	2·3		N W.
7	29·707	·226	40·7	2·7	} 1·780	(var.)
8	29·225	·482	45·7	5·0		E.
9	29·698	·472	47·0	3·3		N W.
10	29·904	·206	44·3	2·3		S E.
☽ 11	29·795	·109	48·0	4·0	0·353	E.
12	29·684	·160	56·3	9·0		W.
13	29·930	·245	53·0	3·3		W.
14	29·804	·142	50·7	3·7	0·848	E
15	29·429	·377	54·3	6·3		N W.
16	29·889	·461	48·3	6·7		N W.
17	29·876	·118	51·7	5·3		S E.
○ 18	29·114	·759	58·0	6·3	1·133	S.
19	29·180	·317	41·7	16·3		N W.
20	29·700	·520	44·0	6·3		N W.
21	29·826	·141	45·7	1·7		(var.)
22	29·622	·204	50·7	5·0	0·172	S E.
23						N W.
24	29·535		51·7		0·120	S E.
25	29·368	·167	52·7	4·3		N W.
☾ 26	29·531	·162	42·0	10·7		N W.
27	29·475	·097	49·3	10·0		S.
28	29·454	·020	56·3	7·0		S E.
29	29·162	·293	55·0	6·7	0·617	(var.)
30	29·468	·307	50·0	5·0		W.
31	29·755	·286	47·0	3·0		N W.
Means	29·629	·283	47·0	5·6	6·061	

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LIST OF AMERICAN PATENTS WITH REMARKS, &c.

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